ELECTRICAL REVIEW

[ILLUSTRATED.]

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Incandescent Lamps on Arc Light Circuits.

The Grand Rapids Electric Light and Power Company, of Grand Rapids, Michigan, have for nearly two years past been running incandescent lamps in the same circuit with arc lamps with remarkable success. Mr. W. M. Thomas, the electrician of the above company, has secured several patents covering the vital features of this system of lighting, which patents were issued to himself and the Grand Rapids Electric Light and Power Company, and the said company have the sole control of the same and are now manufacturing the appliances for operating the Thomas incandescent system, which they are prepared to put upon the market. Manufacturers of lamps, who are prepared to supply such lamps, will find it to their advantage to communicate with the above company. Mr. Thomas has also secured letters patent on a three-wire incandescent lamp, which is also a feature of his incandescent system. By means of the Thomas system, when a lamp or lamps become broken or exhausted and cease to operate, the lamp, or loop of lamps, as the case may be, is automatically switched out, and the generator and propelling power is instantaneously relieved of the amount of propelling energy required to run such lamp or loop of lamps when in operation. We are aware of various devices which are now used for automatically shunting the current in case of lamps giving out, but such appliances simply throw into circuit a corresponding resistance to take the place of the lamp which has been cut out, thereby affording no relief to the generator or motive power. The Thomas system is very simple in construction and not liable to get out of order. His invention supplies a want that has for a long time been needed, affording a means by which lighting companies who have established central stations for supplying electric lighting in cities and villages can supply both arc and incandescent lights from the same circuits, without any extra expense of lines. Of course, the system has no advantageous features for incandescent lighting over the regular incandescent system of lighting by means of isolated plants. Mr. Thomas is a young man of great promise, and as an electrician he has developed some very useful and remarkable inventions during the past three years, as will be seen by examining the Patent Office reports, among which inventions is a simple and ingenious arc lamp, cuts of which are now in the hands of the engravers, and will shortly appear in these columns, with a full description of the lamp and its advantages. The Thomas patents are all controlled by the Grand Rapids Electric Light and Power Company, of Grand Rapids, Mich., and any information regarding any of these inventions will be cheerfully given upon application to them.

The cuts on this page represent the Thomas cut-out system for incandescent lighting on arc light lines in two forms. Fig. 1 represents the cut-out as constructed for any number of lamps in Multiplex Arc Series. Fig. 2 represents a cut-out, fixture and lamp complete, for use where it is desired to pass the whole current through this lamp, the lamp containing two carbon loops.

* * During the last three years the Union Switch and Signal Company, of Pittsburgh,

FIG. 2.—THE THOMAS INCANDESCENT LAMP.

has erected over 2,500 levers of the Saxby & Farmer interlocking switch and signal devices. At the present rate of orders the company will place about 1,500 of these during the present year. In 64 days it completed the largest pneumatic interlocking and block-signaling system in operation in this country—that of the Central Pacific at Oakland, Cal. This system embraces at that point 41 switches and locks, 1 bridge draw-bolt lock, 110 signals, 2 highway crossing gongs, 32 bell circuits, 31 electric locking sections and 11 detectors and circuits which protect thirteen switches. A train can now be dispatched every half minute with absolute safety.

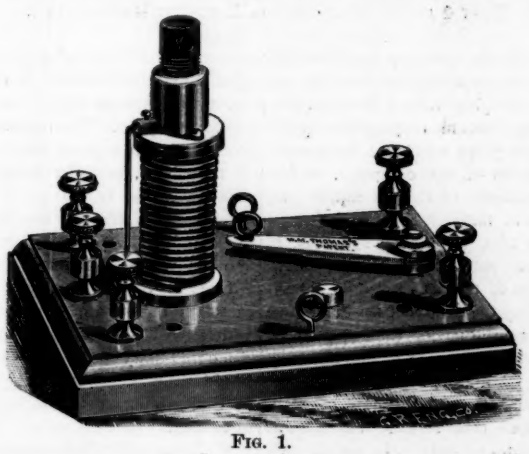


FIG. 1.

On the Suppression of the Nitrous Vapors of the Bunsen Battery and on a New Battery Which is Depolarized by Air.

BY M. A. D'ARSONVAL.

The suppression of the nitrous vapors in the Bunsen element has occupied many inventors. In a recent memoir M. A. Dupre proposes to add to the nitric acid bichromate of potash for this purpose. This remark was already made by Ruhmkorff, who communicated it to me personally in 1869. The celebrated constructor never omitted indicating this receipt to his clients, and one of them, M. Ernest Saint-Edme, even published it in the following terms in 1871:

"M. Ruhmkorff has indicated a process for neutralizing the emanations of hyponitric vapors. This process consists in filtering the nitric acid over crystals of bichromate of potash. The electromotive force is not affected, and the emanations cease."

I have often employed this method, which answers very well during the first hours, especially if a very intense current is not required.

The nitrous vapors reappear, though less abundantly, as the battery goes on working. This is quite intelligible; as long as chronic acid exists it oxidizes the vapors until it is converted into nitrate of chrome. From that moment the battery acts like one with dilute nitric acid.

The salt of chrome derived from the reduction of the chromic acid does not act by absorbing the binoxide of nitrogen, this property belonging exclusively, as Peligot has shown, to the salts of the protoxide. By substituting nitric acid for sulphuric acid in Poggendorff's mixture, the coefficient of polarization of the liquid is decreased. Further, the presence of nitric acid presents the double inconvenience of giving off acid vapors and attacking the zinc when the circuit is open, which is not the case with Poggendorff's liquid (bichromate and sulphuric acid), especially if we adopt Fuller's arrangement (zinc at the center, dipping into a little mercury). Batteries of this kind are absolutely inodorous, and act very little when the circuit is open, especially if we take care to purify the sulphuric acid with oil, as I have indicated.

In 1880, during the researches cited below, I employed for the suppression of the nitrous vapors, a method very efficacious, though scarcely practical, for which reason I have not mentioned it in my memoir.

This method consists in adding urea to the nitric acid. In presence of the nitrous vapors the urea is decomposed; nitrogen and carbonic acid escape, while ammonia and water combine with the excess of nitric acid. The same effect is produced if the nitric acid is diluted with urine. In this case the decomposition, in consequence of the presence of mucus, is attended with a great quantity of froth, but the suppression of the nitrous vapors is as absolute as with pure urea.

The principal inconvenience of Bunsen's battery, from an industrial point of view, lies not so much in the nitrous vapors given off as in the real waste of nitric acid which it occasions. In a series of researches on batteries, I showed that the Bunsen element only utilizes for depolarization about 130 grms. per kilo. of acid, and that the mean weight of the acid expended reaches tenfold the zinc consumed when the battery is required to perform its maximum work. I have indicated for this purpose various means, which have become industrial, for utilizing in depolarization all the nitric acid, and suppressing almost completely the nitrous fumes. For the details I refer to *La Lumiere Electrique* (Recherches sur les piles, 1881).

In all batteries with a depolarizing agent, this is the expensive part; the zinc only plays a relatively insignificant part in the cost of such apparatus.

I have made several attemp'ts to obtain from the air, by an indirect method, a depolarizer which costs nothing—*i. e.*, oxygen.

The following process has so far given the best results: In a flat Bunsen element I substitute for the nitric acid surrounding the carbon a solution of bichloride of copper in hydrochloric acid. With an open circuit the element has an electromotive force of 1.5 volt. On closing the circuit we obtain a current of 8 to 12 amperes with the flat element of Ruhmkorff's model. The solution of copper is dissolved, the copper is deposited on the carbon, but it does not remain there. In presence of the hydrochloric acid and the air it redissolves almost instantaneously. The re-solution can be rendered more rapid by increasing the surface of the carbon, or by blowing air into the porous vessel.

We see that in this arrangement the chloride of copper is constantly regenerated, and that the real depolarizer is the oxygen of the air.

The author gives this process merely to "take date," and promises further particulars.—*Comptes Rendus.*

—— The Poughkeepsie (N. Y.) plant, built by the American Electric Manufacturing Company, is very nearly completed. They bought land, erected a building, put in boilers, heaters, and everything else entirely new. The station will have a capacity of 114 arc lights, with room enough to double this and for the installation of an incandescent plant in connection with it. The dynamos and lamps will be placed in position this week, and will be ready for operation either the last of this or first of next week.

The Criado Electric Illuminator.

This illuminator, invented and manufactured by Messrs. Stout, Meadowcroft & Co., is used for medical, surgical and dental examination. The value of electric lights for assisting in examinations of the mouth, throat, gums, teeth, eye, ear, etc., is well understood by physicians, surgeons and dentists. A new and compact instrument for the application of the light is the one illustrated in Fig. 1. It consists of a polished, hard rubber handle, 5¼ inches long, with a tongue depressor, lamp shade and a laryngoscopic mirror, and having an Edison lamp mounted in the end. All parts, except the rubber handle, are silver plated. It will be seen that many points are covered in this instrument. For instance, although the light of the lamp is sufficiently powerful to be of great value in examinations, the rays do not strike the eye of the operator, as the lamp is covered by the cylinder *B*, which acts at once as a shade and reflector. If it is not desired to use the shade or tongue depressor, or laryngoscopic mirror, all or any of them may be removed in a moment. Fig. 2 shows the parts of the Criado Illuminator. It will be seen that all parts screw on. The lamp also is mounted on a screw socket, and may be taken out and replaced very easily. Connection is made with the battery by means of a flexible wire having a plug which fits into the lower end of the illuminator. This connection and wire accompany each instrument. It is exceedingly simple and not liable to get out of order. The lamp and mirror are particularly valuable for examining the teeth and gums, as they can be placed in any position, and the gentle heat of the lamp keeps the mirror free from moisture.

It is unnecessary to attempt any description of the uses to which this instrument can be put by the professional men for whom it is intended. It is, however, apparent that such an instrument in connection with convenient and efficient forms of office and pocket batteries will be of great value and assistance to the physician, surgeon and dentist.

Are Inventors to be Protected?

The Boston *Herald*, in a recent editorial on "The Telephone Monopoly," makes some very pertinent remarks, from which we extract the following:

"The proposed legislation regulating the telephone charges opens up a question which should be considered in its general, rather than in its special bearings. It has been for many years the policy of the United States government to hold out large inducements as a stimulus to inventive genius, the chief incentive being the privilege accorded to the inventor of having for a term of fourteen years the entire control over his invention, thus enabling him to fix the price at which he would sell the invention itself or the right to use it. Every one will admit that the result of this policy has been of enormous service to this country. It has turned the active and fertile brains of tens of thousands of ingenious men into the field of inventive research, and in this way there is hardly a mechanical process that can be named that has not, in the last half century, been simplified, cheapened or expedited, while numerous discoveries have been made which have been, both in process and result secured, entirely new. The benefit that the community, as a whole, has obtained, even while the patent has remained in force, has been immense, for the pecuniary reward which the inventor has desired has only been obtainable when he has shared the fruits of his work with others; for, if he had charged for the right to use his invention a higher price than the advantages of use warranted the community in paying, his patent privileges would be of not the least service to him. For this reason he has been compelled, so to speak, to meet the market. He has had, it is true, a monopoly; but a monopoly that could be of no advantage to him unless he was willing to share with the community in the profits resulting from its use. Thus the different methods of converting iron ore into steel that have been recently discovered have brought in to the inventors of the various processes enormous pecuniary returns. But they would never have been used if, in consequence of their use, a great reduction had not been made in the market price of steel. In a word, the gain has to be shared even during those years in which the patent remains in force, for, if it had not been shared, the inventor would have obtained nothing for his labor.

"But the theory that seems to find favor with the members of our State Legislature is that the inventor, or those who represent the inventor, may receive in the form of profit a larger share than they are entitled to claim. Even the bitterest assailant of the so-called telephone monopoly will not pretend that the community does not receive a share of benefit. Those who use the telephone do so because they realize, in personal comfort or business convenience, a return more than equal to the toll which they pay to the company. If this were not the case, the telephone would not be used. We managed to exist and do business before it was invented, and even now it is the exception, rather than the rule, where it is looked upon as of material service. If the company suppose that it could make more money by reducing its taxes than by keeping them at their present rate, the change would unquestionably be made. But the point will here be raised, should the profits of the company, rather than the convenience of the community, be made the basis of taxation?

"Answering this, we should say that, if the intent of our patent laws is to be maintained, the ratio of the tax or royalty should be determined by the profits of the company; that is to say, assuming that the company or the inventor wished to make as much money as he could, he should be kept free to adopt such methods as seemed to him best calculated to produce this result. The patent system is a species of lottery, in which each prize is offset by hundreds, and perhaps thousands, of blanks If, when a great prize is drawn, the payment of it is to be denied, a great part of the incentive that an inventor now has to struggle year after year in the hope of discovering a new or perfecting an old device will be taken from him. He has now what he believes to be a sure guarantee of reward, if success should crown his efforts; but if, after he has succeeded, the various State governments are to interfere and assume to set a limit upon what he may make out of his discovery, then the patent laws of the national government will lose all their force and meaning. We submit, therefore, that, if the indisputably great benefits of our patent system are to be maintained, successful inventors must, in the time that the law allows them, be given that complete freedom of action which the law permits. To limit this freedom of action will be to strike a serious, if not a fatal, blow at our entire patent system."

FIGS. 1 AND 2.—THE CRIADO ELECTRIC ILLUMINATOR.

On the Electro-Conductivity of Solid Mercury and of Pure Metals at Low Temperatures.

BY MM. CAILLETET AND BOUTY.

The electric resistance of pure metals increases with the temperature. According to the experiments of Matthiesen and Benoit (Pogg. Ann. cxv., p. 353, and *Comptes Rendus*) lxxvi., p. 342), the mean coefficient of the increase of resistance for a degree of temperature between 0° and 100° differs little for different metals, and does not deviate much from $\frac{1}{273}$—*i. e.*, the coefficient of the expansion of gases. If the same law continued to be applicable at low temperatures, the resistance of a metal, varying as does the pressure of a perfect gas at a constant volume, would furnish a measure of the temperature, and would vanish at the absolute zero.

We have experimented upon mercury and various other pure metals. The mercury was contained in a capillary glass tube turned spirally and terminating in two wide tubes, into which plunged thick electrodes of amalgamated copper. The reservoir of a hydrogen thermometer penetrated into the interior of the spiral, and the whole was plunged either into ice or into a bath of methyl chloride, or of ethylene cooled by a current of air. When we wished to operate upon another metal—for instance, copper—we substituted for the spiral tube a hollow bobbin of wire coil d upon a support of ebonite, in which had been made wide apertures, so that we could satisfy ourselves of the mixture of the liquid strata, the uniformity of temperature of the bath, and the metallic resistance to be measured.

We have used relative measures only. The resistance in question was compared with an invariable resistance formed by a column of mercury at 0° by means of a Wheatstone bridge, and of a very sensitive reflection galvanometer. The following results have been obtained:

1. *Mercury.*—The empirical formula given by Mascart, De Nerville and Benoit, for the apparent resistance of the mercury in the glass above 0°, is applicable down to the temperature of congelation. On solidifying, mercury suddenly becomes more conductive, in a proportion which at — 40° is equal to 4.08. The resistance of the solid mercury then decreases regularly as the temperature falls, and between — 40° and — 92.13° it is accurately represented by the formula

$$r_t = r - 40\frac{1 + a\,t}{1 - 40\,a}$$

in which t represents Centigrade temperature with

$$a = 0.00407.$$

This co-efficient of variation, a, nearly five times greater than that which belongs to liquid mercury, approaches closely that of other pure metals in the solid state.

2. *Silver, Aluminium, Magnesium, Tin.*—For these metals the resistance is represented by the formula

$$r_t = r_0\,(1 + a\,t),$$

and the values of a, deduced from numerous experiments executed at different temperatures, are the following:

	a	Ranges of Temperature.	
Silver	0.00385	+ 29.97°	— 101.75°
Aluminium	0.00388	+ 27.70	— 90.57°
Magnesium	0 00390	0	— 88 31°
Tin	0.00424	0	— 85.08°

These values of a, very closely approximating to those which belong to the same metals near 0°, according to Matthiesen's experiments, are for the first three metals almost identical. The value of a for solid mercury falls between the value common to silver, aluminium and mercury, and that which belongs to tin.

3. *Copper.*—The most complete experiments are those which we have made upon copper. We have furnished the following values of a deduced from some thirty experiments, which have been divided into three groups.

	a	Ranges of Temperature.
Copper	0.00418	0° to — 58.22°
"	0.00426	— 68.65° to — 101.30°
"	0.00424	— 113.08° to — 122 82°

These values of a are a little higher than those which are deduced, in the neighborhood of 0°, from the formulæ of Matthiesen and Benoit. The variation of the resistance is, moreover, almost absolutely regular, and dispenses, in case of need, with reference to the hydrogen thermometer for the measurement of temperatures between — 20° and — 123°. At this latter point no further appreciable variation of a is to be observed which seems to indicate that the approximate agreement of the hydrogen thermometer, and of the copper spiral thermometer, would extend further.

4. *Iron, p'atinum.*—These two metals deviate widely from the others by the variation of their resistance above zero, and they deviate in the same direction at lower temperatures. The formula

$$r_t = r_0\,(1 + a\,t) \qquad (2)$$

is suitable for iron from 0° — 92° with a = 0.0049, but it is not applicable to platinum. The value of a deduced from the formula (2), which in the neighborhood of 0° would be about 0.0030, increases, in fact, as the temperature falls and becomes 0.00342 for an inferior limit equal to — 94.57°, thus platinum approximates to the other pure metals as the temperature falls.

In short, our experiments from the electric resistance of most pure metals decreases regularly as the temperature falls from 0° to — 123°, and that the co-efficient of variation is approximately the same for all. It appears probable that this resistance would become extremely small, and, in consequence, the conductivity very great at temperatures below — 200°, though our first experiments do not enable us to form a distinct idea of what would take place under such conditions.

We continue these researches, employing the extreme cold obtained by the rapid evaporation of liquefied gases.

—— The city council of Newark, N. J., have accepted the proposition of the United States Electric Light Company to light the city with electricity. This company contemplate erecting one of the tower lights at some convenient point in Orange, N. J., at an early day.

Aerial Wire Conduit.

The aerial conduit for electrical wires, illustrated in this issue of the REVIEW, and which we described several weeks ago, is claimed by its inventor, who is a practical telegraph and telephone man of many years' experience, to possess advantages that are worthy of careful consideration. Should the underground craze of our learned legislators subside, then this conduit scheme, or one similar, will likely receive abundant notice from the practical side, for, as the inventor says, "one bad sleet storm in a city like New York would cost enough to conduit all the heaviest lines in the city, and then just think of it: the wires when so protected would last forever, instead of having to be replaced every few years!"

The particular features of this conduit, as claimed by the inventor, are outlined in the following:

Being enclosed in a water-proof and air-tight metallic box, the wires are free from all weather and atmospheric disturbances.

They are not affected by wind, rain, snow, sleet, magnetic storms, nor by ordinary fires.

There can be no such thing as crosses or induction from other companies' wires.

Breaks can scarcely occur inside of the box. It will be as easy to get at the wires as if they were on poles. This box could be fastened on roofs of houses (instead of fixtures), taking up but little room, doing no injury to building, and protecting wires from all disturbances.

Less wire will be exposed than by any other system, and it is the only system that can be banished exclusively to the alleys and work. As regards electric light wires, it removes all danger.

Different compartments can be carried on in conduit for different classes of wires.

The box can be connected to the ground at several places, and acts as one main ground plate for the entire exchange, and carry off all lightning from the wires.

The wires being enclosed in box, and not exposed to the weather, will not rust and will last much longer than when strung on poles.

Fig. 1 of the illustrations is a perspective view of a section of the aerial conduit, portions of the chamber being broken away to exhibit the wires contained therein. Fig. 2 is a transverse section through the chamber a ta point intersecting one of the combined wire-supporting and frame bracing plates. Fig. 3 is a variation of the same. Fig 4 shows a portion of the cover in perspective. Fig. 5 is an elevation showing the construction of several wire-confining devices, and Fig. 6 is a longitudinal section through the lap-joints of the removable cover.

A line of supporting posts, *A*, may be tamped into the ground until solid, or by means of suitable flanges at their bases, and the bolts, *D*, secured to a foundation of masonry, *S*, as shown. These posts may be of any suitable material, but preferably they are formed of cast-iron, having the flange *B* at the upper end, which projects sufficiently upon either side of the continuous chamber *A*. Upon this projection the cover *a* (when removed from its normal position) may be placed edgewise, which arrangement obviates the necessity of lowering it to the ground when the wires are being repaired. The said chamber is composed of the side sheets, *K*, having the flanged bottom sheet, *K'*, riveted to the lower edge thereof. The plates *g*, one of which is placed immediately over each supporting post, are used mainly to impart a rigid rectangular form to the sides of the chamber, and being provided with flanges *i* they are securely riveted thereto, but they are also utilized as supports for the wires *W*, which are passed through the perforations *d*. These apertures may have the insulating rings or thimbles *h* inserted therein. There is provided at a suitable point or points intermediate of the plates *g* a series of thin vertical supporting strips,

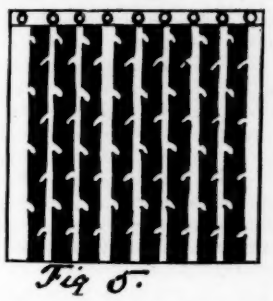
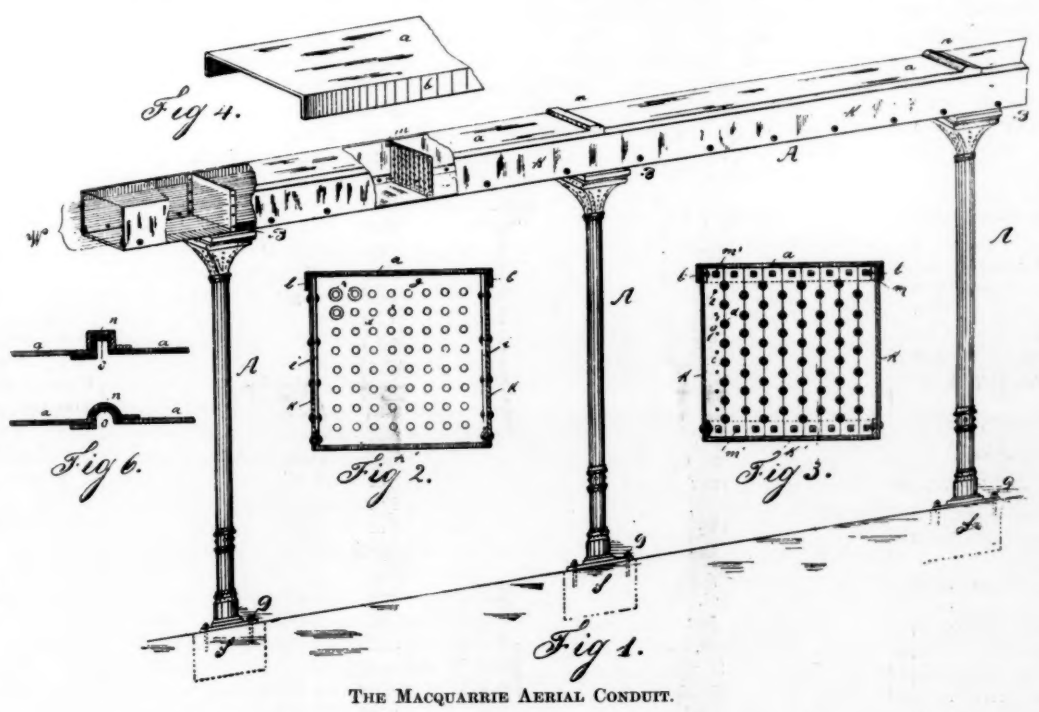


Fig 5.

g' (shown particularly in Figs. 3 and 5), having the notches *d* along each edge, in which the wires *W* are carried, and securely fastened by means of a tie wire that is passed through the smaller apertures *e* and encircles the main wire. The form of the said notches is obviously immaterial. However, those exhibited in Fig. 5 are preferred, for, by reason of their peculiar booked shape, they will retain the wires in position without tying.



THE MACQUARRIE AERIAL CONDUIT.

The strips *g'* are, for convenience, removably secured to the transverse bars *m* by means of the screws *m'* or equivalents. A pair of these bars, by means of a flange upon each end, are attached in a vertical line to the sides of the conduit, as shown. A removable weather-proof cover, *a*, having the pendent side flanges, *b*, and provided with the raised portion *n* near one end, and with a similarly-formed elevation, *o*, at the opposite extremity, perfectly protects the contents of the conduit.

The length of each section of cover corresponds with the distance between the centers of the supporting posts or columns. The raised portion *n* of the cover joints is of such dimensions as to fit snugly over the similarly-formed projection *o* of the cover section underlying it, thereby forming a tongue-and-groove joint. It is evident that telegraph and similar wires can be confined in a very limited space, a ten-inch conduit accommodating four hundred wires. D. B. Macquarrie, of Kansas City, Mo., the inventor of the system, has devoted probably as many years to telegraph and telephone line construction as any man of his years in the country, and his work in this line is certain to attract attention.

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* * In Germany a scientific journal made the statement that it would be beneficial to the eye-sight to print books in dark blue ink on pale green paper. The first volume printed in this way, "The Natural History of the Women of Berlin," has just made its appearance.

Overhead Wires.

Our contemporary, the London *Electrical Review*, says on the above subject that, "it was only what might have been expected, that the report of the Special Committee of the House of Commons upon the subject of telephone and telegraph wires, which we published in full last week, should not meet with universal approval. That section of the public which professes to discover in overhead wires a source of the greatest danger to the safety of the community, cannot of course forgive the Committee for coming to the conclusion, so antagonistic to its own cherished views, that 'the risk of danger to the public from overhead wires has been very greatly exaggerated.' The fact that 'the accidents which have been proved in evidence have been few and insignificant,' has no weight with those who have already made up their minds beyond all possibility of conviction to the contrary by arguments however forcible and conclusive to ordinary mortals. For want of other grounds upon which to base their continued opposition, they now take exception to the composition of the Committee—an ignoble mode of proclaiming defeat which has been adopted before, but rarely with success.

"As for ourselves, we must confess to some hesitation at the first perusal of the report in accepting some of the suggestions of the Committee; but further thought and a more careful study brought clearer light, and while admitting that with regard to some minor points, there may be room for modification, we are of opinion that the recommendations are upon the whole equitable, and such as may readily be carried out with advantage to the companies principally concerned and benefit to the public.

"The main features in which reform is advocated are the granting of compulsory powers, subject to appeal, to the Postmaster-General, and the placing of the telephone companies, as his licensees, upon the same footing with himself, with the only proviso that the wires of the companies shall not interfere with those required for the general public telegraphic service. The greatest difficulty which presented itself to our mind was with regard to the proposition to empower the Postmaster-General and his licensees to make attachments to private property with the consent of the occupier only. It seemed at first somewhat unjust that the owner should have no voice in determining whether an attachment should or should not be made to his premises. Similarly also with regard to passing wires over property, without attachment, in which case it is proposed that neither owner nor occupier should have the right of prohibition. But the attendant provisions that no vested interest nor easement should be conferred, that the company should not be relieved from any claim for damage which it might occasion, and, in the former instance, that the consent of the occupier should hold good only during the term of his occupancy, considerably modify the seeming stringency of the powers given to the telephone companies. The right of appeal would always exist, and in cases where positive and permanent depreciation of property would accrue, the local authority, the county court judge, the Railway Commissioners, or whomsoever were constituted the arbitrating authority, would no doubt adjudicate in a fair and equitable manner.

"There might very possibly be cases where the objection by owner or occupier would be merely of a fanciful or obstinate character; and no great hardship can be urged where such is overruled in the general interest. For example, in an instance of the kind given in evidence before the Committee, where many persons in one locality were desirous of being connected with the telephone exchange, but were prevented in consequence of the inability of the company to obtain permission to run the wires, little sympathy will be felt for those obstructive members of the community who thus, probably for purely sentimental motives, object to the running of lines over their premises. These remarks do not, of course, apply to cases where actual danger is to be anticipated, nor even where inconvenience may be caused; in the latter eventuality compensation might very fairly be awarded, while in the former the local authority might be depended upon to insure prohibition.

"The occurrence and repetition of the phrase 'public convenience' in allusion to the telephone in the report has been seized upon in certain quarters as giving an opportunity for the indulgence of a covert sneer at the possibility of a commercial enterprise becoming a service of great public utility. This was scarcely to be expected, perhaps, from those professing at other times an admiration for this wonderful and useful invention; but we may dismiss it with the remark that the same sneer would apply with equal effect to railways, which have long enjoyed precisely the powers, so far as the analogy can extend, now proposed to be granted to the telephone companies."

Jablochkoff's New Battery.

A most laudatory article on this new battery—"auto-accumulator," the inventor calls it—recently appeared in an English journal of the highest repute, and we fear that in some minds considerable misunderstanding, not to say misplaced confidence, in the new idea will result therefrom. So far as we can judge, this triple electrode battery is about as valuable a production as the same inventor's electro motor, which is well known as the most inefficient of all which have yet been tried. We shall endeavor in our next issue to show that this apparatus, which is said to produce one-horse-power hour of electrical energy for one half-penny, is, if not a retrograde movement, certainly, if we do not misunderstand it, no advance in primary batteries.—*London Electrical Review.*

—— It has been observed by Professor Holdefleiss that beet seed sown in a pot in which the soil was exposed to the electric light germinated two days earlier than similar seeds without the action of the electric light. Another interesting observation is that of Herr Scholler, who has noticed an exceptional luxuriance of beets in a small plot which had been struck by lightning.

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Address all communications and make all checks and P. O. orders payable to order of ELECTRICAL REVIEW P. O. Box 3329, New York

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Mr. J. Viennot, 150 South Fourth Street, Philadelphia, is our accredited representative for Pennsylvania.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill. will represent the REVIEW in the West.

Messrs. Wm. Dawson & Sons, 121 Cannon Street. London, England, are our representatives for Great Britain.

NEW YORK, JUNE 13, 1885.

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There is abundant need of an electric brake, shown by recent railway accidents in this country and England, in which the vacuum brake failed at the critical moment. The *Railway News* of Philadelphia, in a well written editorial, calls the attention of railroad men to the "absolute necessity of having good and reliable, continuous brakes." An electric brake that will answer all these essentials, unless we are much mistaken, will soon be announced.

The Executive Committee of the National Electric Light Association is composed of earnest, energetic men, and we are confident that the meeting in August, as managed by them, will be a pronounced success. Every electric light man should contribute, by his presence, to that occasion.

A few of the friends of Mr. Wm. H. Bent met at Mine Host Park's, Boston, Tuesday, and presented that gentleman with a silver mounted cane. Judge Bent has been long connected with the telephone business in Massachusetts, principally in Lowell, having been attorney for the several companies merged into the New England Company in 1883, and since the consolidation has continued as legal adviser for the New England Company. He retires from the service of the company July 1st.

EXECUTIVE COMMITTEE MEETING.

The Executive Committee of the National Electric Light Association met in the parlors of the Union Square Hotel, Tuesday, at 10 A.M. The members present were J. F. Morrison, Baltimore; George S. Bowen, Chicago; H. M. Cleveland, Hartford; F. Ridlon and W. A. Hovey, Boston; and William Hochhausen, Brooklyn. After a general discussion over the time and place of the next meeting of the Association, it was decided to meet on August 18th at the Union Square Hotel, New York City, special accommodations and rates having been offered by the hotel proprietors. Mr. Summerfield Baldwin, of the Brush Electric Light Company, of Baltimore, was elected Secretary and Treasurer. All companies, firms, or individuals, owning or operating electric light plants, or manufacturing electric light apparatus, are invited to become members of the Association, by sending membership fee of $10 to the Treasurer. A number of papers of interest to the electric light people will be arranged for, and an interesting programme may be expected at the meeting in August.

INTERESTING CABLE COMPETITION.

There is always a good deal of rivalry between the cable companies as to which shall convey the name of the winning horse in the famous Derby race from London to New York quickest. This year proved no exception to the rule, and astonishingly quick time was made. The *Herald* announced the quickest on record by the Mackay-Bennett as four seconds from the Grand Stand at Epsom, while the Direct Company claim to have performed the feat in three seconds. In such a case, it is, of course, hard to really decide which may have been the quickest, but we may point out that, while it was just possible to accomplish it in four seconds, it was not in three, for this reason: It is well known among cable men that the Atlantic cables are only capable of a certain speed. Speed on cables is usually computed at the rate of so many five-letter words per minute. Now, admitting the word "Melton" as a word under this method, and the time to have been three seconds, it will be manifest that it must have been passed from London to New York at the rate of not less than twenty words per minute—a speed which the Direct cable certainly is not capable of, regardless of the fact that any dispatch coming from London to New York has to be repeated in Ireland and Nova Scotia. We commend the desire of our friends to excel, but, at the same time, must ask them to be consistent.

AS TO THE SO-CALLED AMERICAN EXHIBITION IN LONDON.

Some time since it was announced, with something like a blare of trumpets, that a grand exhibition would be in the near future opened in London, composed exclusively of American manufactures, and ever since then pamphlets, replete with florid descriptions and high-sounding names, have been distributed far and near. Men whom we had come to know and to admire under the unpretentious names of "Bill" Smith and "Jim" Brown are suddenly transformed and promoted in the pages of these pamphlets to the Hon. William Montague Smith, LL. D., and General J. Plantagenet Brown, ex-Minister to Kamschatka. From the biographies attached to their names, we learn that they have for years been prominent in the councils of the National Executive, and have received full assortments of decorations and medals from the effete monarchies of Europe for their high character and great achievements. Reading this, we almost forget all about the coming American Exhibition in London, and can only wonder at our own rash boldness at having heretofore regarded them under the plebian names of "Bill" and "Jim." The investigations of the daily press have shown that many of the well-known and reliable business men, whose names are recorded as directors and patrons, have not authorized such enrollment, and this fact, taken in connection with the absurd and flambuoyant utterances of some of the would-be projectors of the enterprise, point to the presence of a very robust colored gentleman on the fence.

We learn from hints thrown out by the Commissioner-General and other commissioners and generals of assorted sizes that it is proposed to make the coming exhibition—when it comes—exclusively American, and on a scale proportionate to the resources of the country over which the American eagle flaps his wings at all times of the day and night. All exhibitions held heretofore are to sink into insignificance when compared to the American Exhibition of 1886 in London. It is to give the people, not only of London and England, but also of all the other effete dynasties of Europe, a good conception of the vast resources of America and of the unparalleled ingenuity and enterprise of Americans; and it is to bind in chains of affection stronger than links of chilled steel the people of the two hemispheres. European capitalists are to be thoroughly convinced that American mining and other securities still have millions in them, and close to the surface, by views taken on the spot by special artists, and by miniature representations of America's inexhaustible mines, with the metals so boldly in sight that they dazzle the eye, and of railroads which are downhill both ways and turn out money like water, or rather turn out "water" and call it money. People not blessed with the necessary ready cash to invest in stocks, but still removed a comfortable distance from want, are to be induced to exchange their slow-going shares for good old American securities Seriously speaking, we know nothing against the reputation of any man connected with the enterprise, though the Boston *Post* speaks of one of its officers in very uncomplimentary terms, but the whole business has an air of impracticability about it, and we would advise electrical people to carefully look into the matter personally before making any promise regarding it or going to any expense.

ARE THESE ELECTRIC LIGHT TESTS RELIABLE?

The photometric tests which have been going on for some time under the auspices of the Franklin Institute, in Philadelphia, were recently completed, and will at some indefinite period in the future be given to the world. Certain portions of these results have already been made public, and, if they fairly represent the whole, the discriminating public can wait without impatience almost any length of time for the balance, or even hear without a sigh that they will not be made public at all.

It is that portion of these tests which has to do with the life of the incandescent lamp that is most unsatisfactory, for it contains on the very face of it evidence of serious error.

It must have struck every one familiar with the incandescent systems as somewhat strange that lamps which have been in use for years alongside of the Edison, without any marked difference in the duration of life, should be found so wanting as is charged in this Franklin Institute manifesto.

If a committee of the Franklin Institute should report, after a careful examination of our office cat, that Thomas could not survive the eating of fish, we would, of course, cease placing before him that vertebrated, oviparous marine animal. Yet we could not help remembering that he had been eating fish these three years without exhibiting any physical discomfort. And when they tell us that at the end of the 1,064th hour of continuous burning, when the Edison lamps had lost only 1 out of 21, the Weston had lost 17 out of 24, we cannot believe, being familiar with what these two systems have done in practical work for several years, that any such extraordinary disparity exists between them.

We are not surprised that the Edison lights were, with one exception—no doubt, this was a defective lamp—all aglow at the end of the so-called test, nor would we have been surprised if, the test having been prolonged, they should have lasted for 2,000 hours, for they have often done this. But so have the Weston incandescent lights of the United States Company. Thousands of these Weston incandescent lamps are aglow to day almost side by side with the Edison lamps, and no such extraordinary difference in their respective lives has been observed while in practical operation. Knowing Edison as we do, and knowing him to be a fair-minded man, we don't believe, though he is most interested in the results, that he would claim any such superiority for his lamps over the Weston lamps, as is to be inferred from the results of this absurd farce called a test.

We have spoken only of the Edison and Weston lamps, because the other incandescent lamp people are evidently satisfied that the committee had neither the experience nor facilities for making a thoroughly reliable test, refused to enter their lamps in the trials, and hence their names are not mentioned in the recently-published synopsis of the coming report.

In what we have said above, or we shall say later on, we do not mean to charge, or even to infer, that anybody connected with the Franklin Institute, or any member of the committee making the tests, had any hand in directing or changing the results, because we never for a moment had any such suspicion. We simply believe the results of the lamp tests, especially where they refer to the life of the lamp, to be unreliable and misleading, if not absolutely erroneous and worthless. This may have come from several causes—from inexperience of the members of the committee in making such tests, incompleteness of the apparatus or carelessness.

The various systems of incandescent lamps require for their proper efficiency currents of very different amounts of electromotive force; and though an attempt may, perhaps, have been made to provide for this by giving to each lamp a resistance coil of German silver wire thick enough to reduce the current to the necessary intensity, it were easy to make a mistake concerning this matter, as every one knows who has watched similar experiments. There was a current, as we are informed, as strong as 120 volts in the line wire.

Whilst these tests for the life of the lamp were in progress, a singular phenomenon occurred, having more or less effect upon the lamps. The needle of the galvanometer, which obeys the laws of terrestrial magnetism, pointing due north or south + or — the local variation, has a tendency, as we know, to align itself at right angles with the course of any current passed through the insulated wire of which the galvanometer is in part composed, and to take a definite position when this tendency and that to point north and south are equal the one to the other. The strength of the current, whether weak or strong, has, as we know, a direct influence upon the position taken up, and from this position it is easy to discover just how much electrical energy is present. Now, the peculiar phenomenon to which we have alluded was the direct expression of a magnetic storm then prevailing—a fact later on corroborated by dispatches from the Government observatories. During its prevalence the earth's attraction for the needle visibly decreased. The testing committee, thoroughly unprepared for this, adopted the earth's magnetism for their standard, and regulated the force of the current passing through the lamps, as before, according to the pointing of the needle. The lamps, having in consequence a variable and lessened current, were visibly dimmed, and remained

so for several days. This, of course, affected the intensity of the lights, and might not unreasonably be looked upon as injuriously affecting their life, and possibly the one type of lamps more than the other.

Besides the practical reasons which have here been noted, there are others quite as potent in the support of the inference that the tests contain serious errors and in the interests of the readers of the ELECTRICAL REVIEW we purpose to record them, setting down nought in malice and having no personal feeling in the matter whatever.

The writer of this, who went to Philadelphia some time since to enquire into the nature of these tests, had a curious experience, and one which at the time confirmed him in the belief that the tests were of little if any scientific value. Visiting the Franklin Institute he called on Mr. Wahl, the Secretary, and by long odds the best informed and best prepared man in the Institute to undertake or rather to superintend such tests. Mr. Wahl said that he had refused to have anything to do with the tests because he didn't believe in them. They were being made, he said, in the old building where the Electrical Exposition had been held in the Fall and the best thing to do was, in his opinion, to go there and see Mr. Tatham, the President of the Institute, who was superintending the tests. The writer was accompanied to the grounds by a person who might be described as a sort of private secretary to the president, and a paid officer of the Institute. This man before he had proceeded far admitted the fact that though the photometric tests were finished—this was nearly if not quite three months ago—it was very doubtful if they could be seen by an outsider because *they didn't agree*, the one test with the other, and it was, in his opinion, difficult to see just what could be done in the matter of making them agree.

The President of the Institute was found sitting inside what had been the private office of the Exposition. On his face was a look of mingled perplexity and suspicion, a look that became still more intense when his visitor revealed the object of his mission. Now it may be said of Mr. Tatham that he has charge of the Department for the Suppression of News of the Franklin Institute and having had some experience with him during the Electrical Exposition, the writer read the peculiar expression on the President's face to mean that he was in his secretive mood; his impenetrable and aphonous condition. In this supposition he was not mistaken. Pressed as to where the records of the photometric tests were, Mr. Tatham finally admitted that Prof. Marks, one of the investigators, an officer of the Franklin Institute, had "taken them away in his pocket," we quote the words, and he didn't know where he had gone. The object he admitted likewise was to try and discover where the errors were; there being serious discrepancies. This is all that could be got out of him.

"When will the results be made known?" was asked.

"I don't know!" responded Mr. Tatham.

"How can they be had when they are ready?"

To this he replied that the fact and the figures would be found in a certain publication of the Franklin Institute.

The men that made these tests as to intensity, life, etc., of the incandescent lamp, are, so far as character is concerned, above reproach, but as to their ability to make such tests we are not so sure. The fact that the photometric tests were completed nearly three months ago, and have not yet been made public, *en bloc*, taken in conjunction with the fact that the various papers did not agree at that time, would naturally lead to the inference that an attempt had been made to force them to agree, without any intention, of course, to deceive. The life tests which are of a comparatively recent date, were made under unfavorable conditions, as we have shown, and as the results from this latter test are diametrically opposed to what the lamps have shown over and over again while in actual use, it seems not unreasonable to record a doubt as to their reliability from a scientific standpoint and a doubt under such circumstances should be placed to the credit of those whose interests are most seriously concerned.

GENERAL WESTERN NEWS.

On the 2d instant, Chicago was visited by one of the most remarkable electrical storms which it has ever known. Indications during the fore part of the day showed that the elements were getting a good reception ready for an intense and magnificent display of nature's forces. The clouds scurried to and fro like *aides de camp* before a battle, and the telephones throughout the city told of electrical disturbances long before the less sensitive indicators were affected. Between four and five o'clock heavy, black clouds rolled up from the west, and for half an hour or so vivid flashes, accompanied by thunder in every conceivable degree of intensity, from sharp crack to booming and echoing roll, were constant. Then came at first a few premonitory drops, quickly succeeded by a furious driving rain, which fell in slanting sheets. The wind increased suddenly from three to twenty-six miles per hour, and after a brief season, fell back to a rate of six miles. In eleven minutes after the storm broke the thermometer showed a reduction of as many degrees. Another peculiarity of the storm was its gyratory movement—it boxed the compass completely. Fifty-four hundredths of an inch of water fell in forty-three minutes. During the evening, after a period of calm, pleasant weather, a supplementary storm set in, and continued the electrical, hydraulic and pneumatic displays on an almost equally grand scale.

The discharges of electricity were unusually persistent in direction, these being almost invariably vertical; and in many instances two, and even three, discharges followed rapidly in the same apparent line. On one occasion there were three of these, as nearly identical, both as to track and brilliancy, in the space of two seconds. Bolt after bolt descended into the lake at the east of us, whilst at the west of the city the apparently long streaks of light evidently descended to the prairie.

Within the city limits several lives were lost. A man standing in a stable doorway was struck, and fell upon his knees, dead. A gentleman about forty feet from the unfortunate was sensibly affect by the discharge. Two men, pushing a car on a track in a lumber yard in the south-west portion of the city, were instantly killed. One of these had a hole in his head, the other received no outward marks of the accident. These men were seen to fall, and after striking the ground, seemed to recoil and turn completely over. There were several others killed or injured.

At Highland Park, twenty-three miles north of the city, the rod on the cupola of the hotel was struck, and eye-witnesses describe the sight as beautiful in the extreme. The entire rod seemed surrounded by a conical envelope of light extending down its length, diminishing in diameter as it descended. It is evident that the carrying capacity of the rod was insufficient, as more or less of the charge dissipated through the building, and created considerable consternation among the inmates by its skipping from point to point, exploding as it went, in its endeavor to reach the ground. An employe was in the second story of the house, doing some work with a cold chisel. He received a severe shock, and the tool was ruthlessly thrown from his hand by the current.

The telegraph people congratulate themselves on only having a few wires twisted up, and a few lightning arresters burned out. The fire alarm system was uninjured. But the telephone people—well, at daylight the next morning every inspector started out with a pocketful of coils, and played the role of the fellow in the story of Aladdin, who gave new lamps for old ones—bringing back burned spools which they had replaced with new ones. The greatest loss in this line was in the south-western portions of the city. In all the suburban parts of the county, especially south, there were steeples and buildings struck, and one or two fires in consequence.

On the 31st of May the copartnership heretofore existing between S. G. Lynch and C. V. Banta, Jr., was dissolved, Col. Lynch, the senior member of the firm, retaining the office at 144 La Salle, and continuing in the business of handling every variety of telephone, telegraph, and other securities and investments — but electrical stocks are the special favorites with the Colonel. Commencing away back in the early days of telegraphs, the boy Lynch became an operator; then he won his military title in the Union army during the late unpleasantness in the telegraph department; afterward an official in more than one electrical organization, winding up with the secretaryship of the Western Electric Co. here. Subsequently inaugurating the office of which he is now sole proprietor, the Col. has worked in double harness until now.

Speaking the other day of the hue and cry which is just now the order of the day, because of inane legislation in several of the States, the Col. said: "Telephone stocks are just now a better investment than ever; they are comparatively no lower than other stocks. There is nothing alarming in the matter, for at the ruling rate of offers, if one could buy shares of some one who was obliged to sell to raise the wind, they are a fine paying investment. On a basis of one hundred dollars per share they pay 6 per cent. per annum, and at sixty dollars this is ten per cent. The Central Union pays that, and so does the Michigan Company and others. The Wisconsin Company pays 8 per cent." Anyone having a little money to invest can do no better than to counsel with Col. Lynch, who, from his past experience, first in electrical matters generally, and latterly in stock transactions, is well posted, and will cheerfully give any information or advice relative to the purchase or sale of prime securities of whatever nature; but his specialty in the future, as in the past, will be telephone and telegraph stocks.

The Postal Telegraph and Cable Co. has filed a bill against Eugene A. Howell, of Penn., asking for a receiver and injunction. Howell lately recovered a judgment in the U. S. Circuit Court for $61,266, and has issued executions in this State, and levied executions. Suits have also begun in Indiana and Missouri, as well as in Pennsylvania and New York. Judge Blodgett appointed Albert P. Chandler, the present receiver in New York, receiver for this State, and ordered the restraining of Howell and others from advertising or selling the company's property.

If into an atmospheric thermometer with a U-shaped tube, the terminals of iron and German silver wires are brought, these being arranged to produce different thermal effects in the tube, a fluid in the lower portion of this will be moved to show different levels in the two branches, through atmospheric expansion and contraction, and will thus determine the intensity of currents from a given source. This is briefly the amperameter of Hesebus. The fluid used is petroleum. The advantages claimed are:

1. That it indicates the intensity of the current at any moment.

2. Its economy, and that, containing no magnet, it will not be affected by contiguity to the most powerful generator.

3. It will measure alternate currents, as well as constant, and may be used as a galvanometer or a dynamometer.

According to a German correspondent, one element Grene gave an elongation of 4 mm., which, with one unit of resistance, reduced this to 1.3 mm. Six Bode elements gave an elongation of 6 mm., and six similar elements with double surface, 11 mm., while a Gramme machine gave an elongation of from 10 to 20 mm., results which show that the Peltier effect is proportional to the intensity of the current.

Fein, of Stuttgard, has hit upon a novel lamp regulator. The lower carbon is attached to a plunger at the lower end of which a float in a liquid is forced upward by hydrostatic pressure. This force is first sufficient to form good contact in a form of incandescent lamp, and in a small arc lamp of his designing. The support of the lamp contains the float and the carbon; the upper contact is of copper, and is in the form of a wheel, connected to the negative binding post, and the frame of the lamp through a short projecting arm and an upright, the carbon connection with the positive through a platinum sleeve, in which it slides. This lamp, with a current of six amperes and six to eight volts, gave an incandescent light of 40 normal candle power.

The Stanley lamp with the Thomas cut-out, which emanates from Pittsburgh, Pa., has come to Chicago, to stay. Mr. Charles D. Shain, the Western agent here, has located at Room 58, Home Insurance Building. The aim of the agency is not to install plants, but to sell the apparatus for incandescent branches on arc light lines. A number of these lights—the circuits were described recently in these columns—were lately installed in Cincinnati by Mr. Shain, on the Brush Electric Light Company's circuit, where their performance was so thoroughly satisfactory that the entire incandescent part of the plant was purchased by a prominent druggist, who is having it placed in his establishment. The plant includes 16 and 150 candle-power lamps. The Grand Rapids Electric Light Co. has a number of the larger size, and are advertising arc lights for sale. The Monongahela House, Pittsburgh, has been recently lighted by the multiple arc system with 150s, 25s and 16s.

Chicago.

At the adjourned annual meeting of the International Telegraph Company at Portland, Me., Tuesday morning, the following named directors were elected: R. Worthington, of Boston; S. D. Bailey, of Bath; Chas. Danforth, of Gardiner; W. E. Gould, H. M. Hart, A. D. Brown and C. C. Bedlow, of Portland.

Chicago is not dismayed by the collapse at New Orleans, and would like to have a World's Fair in 1892, the four hundredth anniversary of the discovery of America by Columbus. If Chicago secures the Fair, it will be a success. Electrical appliances should have a great deal to do with the exhibition.

The Saratoga (N. Y.) plant, owned principally by the American Electric Manufacturing Company, will be started up either the last of this or first of next week, with a hundred lights. Arrangements are being made to instal an Edison plant in connection with it, to furnish some of the hotels.

The annual meeting of the Erie Telephone Company was held at Albany, N. Y., Tuesday of this week, and the following officers were chosen: President, James W. Bennett; secretary and treasurer, Charles J. Glidden; general superintendent, J. P. McKinstry; transfer clerk, Charles A. Grant.

An interview with George P. Walker, as published in the Minneapolis *Tribune*, regarding the trouble in Erie Telephone Company at that place, is the most laughable chapter lately published regarding the Erie. Mr. Walker is a brother-in-law of President J. W. Bennett, of the Erie Company, and one would imagine he would be inspired, but if he is, evidently a new source of inspiration will have to be found before Minneapolis subscribers are made happy. Mr. Walker's suggestions as to how the service can be improved will cause a smile to chase dull care away from many a troubled telephone manager's face. It's a wonder some enterprising company doesn't secure his service. His remedy for all troubles is more wires and more operators. The public there seem to think a manager with some system would be a good thing. But when the great crow from Lowell flies out there, no doubt everything will be satisfactory.

Telephonic News

*** The Nebraska Telephone Company paid a dividend of $2 per share May 1, 1885.

*** The Mo. and Kansas Telephone Company have ordered 5,000 feet of Patterson cable to be used chiefly at Kansas City, Mo.

*** The Overland Telephone Company offers to purchase the Indianapolis Exchange from the Central Union Telephone Company.

*** The phosphor-bronze wire is still popular with telephone people, the manufacturers in Philadelphia reporting an increasing business. They have just issued a new price list that all patrons can receive by addressing the Phosphor-Bronze Smelting Company, 512 Arch street, Philadelphia.

*** At Pittsburg, Pa., a suit has been instituted by the National Improved Telephone Company against the Bell Telephone Company to restrain the latter from using the Blake transmitter. The general opinion is that the instruments which the National Company control are all infringements on those owned by the American Bell.

*** Lineman Wm. C. Peatty has brought suit for $10 000 against the New York and New Jersey Telephone Company. The plaintiff complains that on April 27 he was instructed to climb a pole by the company in whose employ he then was, to remove some telephone wires As he was descending two of the pole steps broke, and he fell to the ground, fracturing his ankle.

*** The Massachusetts house has rejected the reduced rental telephone bill. It was the same bill that was enacted into law by the Indiana and Illinois legislatures. It will remain to be seen whether the latter legislators or the solons of Massachusetts were the wiser as to the constitutionality of such legislation. The question is now before the courts in Indiana, and a decision looked for in the course of another month.

*** Prof. Alexander Graham Bell thinks the "echo" system of ascertaining when a ship is approaching an iceberg or another vessel sufficiently important for an article in *Science*, and, although old sea dogs gravely shake their heads, it is said that the device has been put to a successful test on rough water. The principle is that any solid body on the surface of the ocean will give back an echo to a sound from the deck of a ship not too far distant, and the navigator, with a bell to make the sound and a telephone to receive the echo, can easily tell when there is danger of a collision.

*** A fire in Detroit, June 3, originated in the room in which the State telephone exchange boards are located, directly off the main operating room. There were sixty operators and two boys at work, who, when the cry of fire was raised, quietly went out. A number of other employes had left the room a few minutes previous, and some were on the stairway going down when they heard the commotion. The fire was extinguished by the fire department with but slight loss, but some annoyance to subscribers on account of burnt office wires resulted. How the fire started is not known.

*** The following from the Indianapolis *Journal* is a well-deserved compliment; Theo. N. Vail, aged forty, appointed by Gen. Grant superintendent of the Railway Mail Service. Successful to a great degree. Then became general manager Bell Telephone Company. Possessed of energy, shrewdness and large executive capacity. Bell Telephone then an infant of small proportions, Vail nursed it and brought it out of its swaddling clothes. Look at its growth now. Vail is rich—worth $5,000,000. President and director in a dozen or more sub-companies. He is also a first-class inventor. A hard worker, genial and kind-hearted.

*** The Bishop Gutta Percha Works are receiving large orders for the Marks' compound insulated copper wire, which seems to have met with considerable favor.

*** The New England Telephone and Telegraph Company have just completed a 45 mile line of hard-drawn copper wire between Belfast and Augusta, Maine, which is working successfully, and expect to complete a line of the same wire from Boston to Portland—one hundred and ten miles—in a few days.

*** The Pan Electric Telephone Company has organized a company in Dallas, Texas, called the Dallas Pan Electric Telephone Company. The par value of the shares is $50, 40 per cent. of the same to be called for upon the election of officers of the company, and in installments of 20 per cent. afterward, as may be necessary during the construction of the exchange. The incorporators are A. J. Porter, J. S. Armstrong, J. D. A. Harris, J. P. Murphy, of Dallas, and Max Elser, of Fort Worth. Work of construction will begin at once, and the exchange, it is claimed, will be open for service about the 15th of July. The amount of stock subscribed is $25,000. A toll line to Fort Worth is contemplated.

*** The Boston *Transcript*, speaking of the maximum rate of telephone legislation, says: The introduction of this bill opens up a number of new and very serious questions. A patent is as much a piece of property as a farm, and he who owns it is secured in his possession for a specified time by United States law. It is for him to determine whether any one shall be permitted to use it, and, if so, at what price; and there is no power competent to compel him to allow its use against his wish, any more than there is to compel the owner of a farm to sell or let it except at his own will and on his own terms. It is fair to presume that the owner of telephone patents will charge no more for the facilities which they furnish than the public is willing and can afford to pay. If this be sufficient to yield them a profit, that profit is the compensation which the law contemplates when it issues, secures and protects the patent. To charge more than the public is willing or can afford to pay for the service rendered would clearly be against the interests of the company. On the whole, therefore, it would seem a wiser and safer course not to legislate in the matter, but to leave the matter of the settlement of telephone rates, under varying circumstances, to the higher and inexorable laws of trade. Human legislation always cuts a sorry figure when it seeks to interfere with them.

*** Vice-President Dickey, of the Nebraska Telephone Company, gives the following résumé of the business of his company, dated May 28:

The total earnings were	$98,566.52	
Total expenses	64,834.16	
Net earnings		$33,732.36
Dividends (cash 2% per quarter)		23,277.32
Surplus	$10,455.04	
" from previous year	3,484.27	
Total surplus on hand		$13,939.31
Our total receipts last year from all sources were	$98,566.52	
For previous year	74,379.27	
Increase		$24,187.25
Total expenses, including reconstruction, last year	$64,834.16	
Total expenses, including reconstruction, previous year	54,972.15	
Increase		$9,862.01
Per cent. of total expense to total earnings last year		65 77-100
Per cent. of total expense to total earnings previous year		73 9-10
Decrease of per cent. of expenses		8 13-100
Per cent. of net earnings to dividend stock last year		11 25-100
Expended in construction last year	$11,162.98	
" reconstruction last year	2,543.64	

"Our dividends have been regularly paid without impairing our property in any manner, while over ten thousand dollars have been added to the surplus fund. Seventeen miles of wire have been added to our toll lines, and 317 subscribers added to our list. The outlook for the coming year is promising. Our reconstruction will be light, while expenses, unless in case of storms or accidents, will not be materially increased."

Telephone Licensees in Boston.

WHO THEY ARE AND WHAT THEY ARE THERE FOR—OUTLINE OF THE WORK OF THE CONFERENCE.

(Editorial Correspondence of the ELECTRICAL REVIEW.)

The Hotel Vendome, Boston, has surrendered for five days to the brightest and most representative telephone men of the United States. There is a marked difference to be noticed in this gathering of telephone men as compared with former ones. Heretofore, when the fraternity assembled, the discussion related to induction, retardation, cables, switchboards, insulation, etc., but now a business tinge colors all conversation, and is felt in all argument and dividends, or, more properly, the lack of them, seems the center around which the discussion rolls and reverberates. Familiar faces are numerous, and, added to these, are several new countenances possessing a commercial cast that would not be out of place in a bank president's chair. The stockholders are well represented—fully as well as the American Bell Company expected—and some of them not in the best of humor, yet all appreciating the generous entertainment provided for them. Nearly all the prominent actors in the telephone business accepted the invitations, and among those present are the following well-known gentlemen:

W. H. Forbes, Boston, Mass., President American Bell Telephone Company.

Theo. N. Vail, Boston, Mass., General Manager American Bell Telephone Company.

O. E. Madden, Boston, Mass., Assistant General Manager American Bell Telephone Company.

Edward J. Hall, New York, American Telegraph and Telephone Company.

Henry Bentley, Philadelphia, Pa., Bell Telephone Company, of Philadelphia.

C. F. Cutler, Brooklyn, N. Y., President New York and New Jersey Telephone Company.

W. D. Sargent, Brooklyn, N. Y., General Manager New York and New Jersey Telephone Company.

W. H. Eckert, New York, General Manager Metropolitan Telephone and Telegraph Company.

Joseph P. Davis, New York, President Metropolitan Telephone and Telegraph Company.

H. Metzger, Pittsburgh, Pa., General Manager Central District and Printing Telegraph Company.

Wm. Kerr, Harrisburgh, Pa., General Manager Pennsylvania Telephone Company.

H. L. Storke, New York, President Empire State Telephone and Telegraph Company.

D. J. Carson, New York, General Superintendent Southern Bell Telephone Company.

James Merrihew, New York, East Tennessee Telephone Company.

Saml. M. Bryan, Washington, D.C., Chesapeake and Potomac Telephone Company.

J. N. Keller, Boston, Mass, General Manager New England Telephone Company.

G. F Durant, St. Louis, Mo, General Manager Bell Telephone Company, of Missouri.

C. N. Fay, Chicago, Ill., Chicago Telephone Company.

F. G. Beach, Chicago, Ill., General Superintendent Central Union Telephone Company.

D. H. Louderback, Chicago, Ill., Vice-President Central Union Telephone Company.

C. H. Haskins, Milwaukee, Wis., President Wisconsin Telephone Company.

Angus Hibbard, Milwaukee, Wis., Superintendent Wisconsin Telephone Company.

Capt. G. M. Stone, Cincinnati, Ohio, General Manager City and Suburban Telegraph Association.

J. R. Mulvane, Topeka, Kans., President Missouri and Kansas and United Telephone Companies.

W. W. Smith, Kansas City, Mo., General Manager Missouri and Kansas and United Telephone Companies.

J. J. Dickey, Omaha, Neb., Vice-President Nebraska Telephone Company.

Flemon Drake, Omaha, Neb., General Manager Nebraska Telephone Company.

W. A. Cowles, Buffalo, N. Y., General Manager Bell Telephone Company, of Buffalo.

H. P. Frost, New Haven, Conn., General Manager Southern New England Telephone Company.

Morris F. Tyler, New Haven, Conn., President Southern New England Telephone Company.

W. S. Smoot, Chicago, Ill., President Western Electric Company.

E. V. Cherry, Cincinnati, Ohio; T. B. Doolittle, Bridgeport, Conn.; Charles R. Truex, Montclair, N. J.; R. W. Devonshire, Boston, Mass.; T. B. Bailey, Boston, Mass.; W. N. Eastabrook, Elmira, N. Y., General Manager N. Y. & Pa. Telephone Company; H. C. Palmer, Buffalo, N. Y,, Secretary Bell Telephone Company, of Buffalo; Samuel Ivers, New Bedford, Mass.; A. P. Sawyer, Newburyport; W. A. Jackson, B. E. Sunny, J. J. Foster, D. A. Smith, E. B. Field, C. J. French, F. W. Harrington, A. O. Morgan, F. A. Angell, J. W. Duxbury, Geo. L. Phillips, I. M. Brown.

C. H. Haskins, of Milwaukee, was appointed Temporary Chairman.

The main features to be discussed as outlined at the first day's meeting are, in brief, as follows:

Classification of exchange rates.

Extra-territorial lines—how best to provice for construction, operation and conduct of the business.

Toll and branch lines, and the development of the business, and best method to provide extension.

Extension of the telephone business to the sparsely inhabited districts.

Private line business in all its branches

Telephone apparatus, bells, switch-boards, individual bells, etc.

Construction of lines—use of cables, both aerial and underground.

Extension and development of the telegraph connections.

There will be many other topics discussed, but as far as possible the callers of the conference will confine them to the above classification. What the licensees want, and will go away dissatisfied if they don't have it granted them, is a decided reduction in the instrument royalties, and in some cases an extension of the time when the non-dividend drawing stock would properly come in for a share of dividends. The gentlemen who own stock in those companies that had to give one-half of the capital stock to the parent company for a perpetual license, are particularly anxious for relief and are heard making energetic inquiries why they had to give more than other companies, whose stockholders are no handsomer than they are—hence why this "discrimination?"

In a later communication your correspondent hopes to be able to give the probable results of the conference, but it is likely that only the last two days will see any decisive conclusions reached.

Boston, June 9th, 1885.

Stock Investments.

Locking up and hoarding away money is possible and enjoyable only to the miser. And the enjoyment of the miser is only a kind of insanity. All men who have secured a start in accumulating money will take rational interest and pleasure in using it in the fields of legitimate enterprise to gain more. It is a quality of money, when rightly employed, to breed and multiply. And in this way it is that money, while increasing itself, adds to the life of productive business and industry all around it. It is the life-blood of commerce and diversified industry. Whoever, therefore, has money must perforce, if he is a sane man, use it as a life force; and the more active and wise he is, the more he will study how to wisely employ it.

How, then, shall men employ money to the best advantage for accumulating it? Apart from manufacturing and merchandising, there are not so many ways of employing it safely and profitably. It may be safely invested, but in how many ways? Not many, if we come to reflect carefully. There are the United States Government bonds, which have the immense advantage of affording the

investor perfectly good security. And it is wonderful how rapidly and enormously the amount thus invested accumulates when the interest is regularly compounded, although, of course, the investor in the Government bonds receives but a low rate of interest. But after Government bonds, what then? There are certain other bonds and stocks that have long proved a most satisfactory means of profitable and safe investments, and among these are telephone stocks. The hold the telephone business is taking on life and commerce is widening and deepening every day; so that as time moves along telephone stocks will become more and more productive as well as more firmly established. The telephone has as certainly become a part of the organic life and forces of society as the telegraph. It will, however, never fall into the hands of a few, being capable of such sub-division and management by the use of small means and simple business machinery. These facts taken together and weighed, it is seen that the telephone stocks must be productive, and their value as a means of investment becomes readily apparent. These stocks have suffered the depression that met all stocks the past year, but are again in demand. Col. S. G. Lynch, of Chicago, a reliable stockbroker, familiar with the best securities known to the money market, and who has been handling telephone stocks with much success for two years past, reports an increased demand for this class of securities, and it is reasonable that this demand should come. Several telephone companies have resumed payment of dividends, the demand for more telephones is steadily increasing, and, unless all signs fail, telephone stocks will soon have a reliable and permanent value.

Interesting Telephone Statistics from Sweden.

We extract from the *Mouvement Industriel Belge* the following concerning the telephone systems of Stockholm, in Sweden. The table below indicates the total number of telephonic communications, and the number of subscribers of the *Stockholm Allmænna Telefonbolag*, or the Mutual Telephone Society of the Inhabitants of Stockholm, the most important in Sweden.

1884.—Month.	Number of communications per month.	Average of communications per working day.	Number of subscribers.	Number of communications per day and per subscriber.
January	71,950	2,612	865	3.02
Febr'y .	76,516	2,928	925	3.16
March..	126,613	4,800	1,162	4.13
April...	143,671	5,711	1,263	4.52
May	177,206	6,535	1,364	4.79
June...	171,592	7,046	1,522	4.63
July . .	203,570	7,363	1,670	4.41
August.	209,871	7,802	1,767	4.41
Sept'r..	251,503	9,317	1,866	4.99
October	295,421	10,577	1,959	5.39
Nov'r..	284,566	10,869	2,101	5.17
Dec'r...	319,803	11,938	2,297	5.38

The other system in Stockholm belongs to the Bell Company. It counted to the 31st of December, 1884, 1,450 subscribers. But this company has not yet made public its statistics relative to its telephonic communications. If to the total number of the subscribers of the two companies above mentioned we add the 49 telephone stations on these lines belonging to the State telegraph direction, we arrive at a grand total of 3,796 subscribers to 117,000 inhabitants in Stockholm. The telephone system of Stockholm comprises three central stations—one in the northern suburban district, a second in the city proper between the bridges, the third in the southern suburban district. The station of the North was opened on the 31st of October, 1883, with 332 subscribers; that of the South on the 1st of December of the same year with 150 subscribers; and that of the city on the 1st of March, 1884, with 170 subscribers. The number of subscribers has rapidly increased. One hundred and seventy-nine of the subscribers are located in the outskirts of the city, and some at a distance of 90 kilometers (56 miles). The difficulties of connection in so extended a system has determined the company to make use of multiple switchboards, and a grand central station for all the lines is in course of construction. This unique station will be arranged to accommodate 7,200 lines. Since the 1st of May, 1881, the central bureaus have been opened day and night. Sixty-three young persons are employed. Besides the 2,288 apparatuses in operation, there are 92 lines in course of construction, which will carry the number of lines to 2,380.

No Interference With International Telegrams.

CENTRAL AND SOUTH AMERICAN TELEGRAPH COMPANY.

NEW YORK, June 6, 1885.

Editors Electrical Review:

"One of the consequences of the political troubles in Central America has been the military occupation of all the cable stations and the suppression of all telegrams not receiving the approval of the authorities. Even the representatives of foreign nations are not permitted to correspond by telegraph with their governments without submitting their dispatches to the military authorities, who frequently suppress them, especially if they are in cipher."

A statement somewhat similar to, and equally as incorrect as the one above appearing in your issue of to-day was published in the *Sun* of April 18.

Our manager at La Libertad, Salvador, replies to the *Sun* statement under date May 8:

"The paragraphs relating to this office are much exaggerated, and must have been written by some one under great excitement, who probably paid too much attention to the ridiculous rumors in the port.

"The statements re News and British and German ministers are totally untrue. As far as I know not a single message signed by ministers of foreign legations was suppressed.

"The twelve messages mentioned were copies of messages which had been handed over to Salvador Government (telegraphs), and were also sent by Pacific mail in case any should have failed to reach their destination in Guatemala."

The Central and South American Company's cable stations have never been occupied by the military. No representative of foreign nations has had the slightest impediment placed in his way beyond when the Government land lines were broken down, as at times will occur during war. Nor have we ever had to submit a diplomatic dispatch, whether in plain language or in cipher, to any local military or governmental authority.

As it may be of interest, I add copies of some messages, etc., bearing on the above subject, including an order from the U. S. State Department, and the proclamation made on the entry of the United States troops into Panama, on the occasion of an attempt to occupy militarily one of the telegraphic stations of this Company.

"WASHINGTON, 16 March, 1885.

"JAMES A. SCRYMSER, Esq.,

"President, Central and South American Telegraph Company.

"A telegram is to-day sent to the United States Legation at Guatemala, holding that Republic responsible for injuries by its authority or with its connivance to cables or interests of United States citizens in Central America.

"BAYARD."

"WASHINGTON, 21 March, 1885.

"SCRYMSER.

"Does the Guatemala office decline to receive telegrams from Salvador to Minister Hall?

"T. F. BAYARD."

"LIBERTAD, 21 March, 1885.

"SCRYMSER.

"Cablegrams received to and from Guatemala, Honduras, and Salvador, with usual promptness.

"Have observed replies to some of Minister Hall's messages in a few hours. Have no means of ascertaining if Guatemala delivers all messages promptly. Salvador hands over and receives in due course.

"CLARKSON, Manager."

"MEXICO, 5 April, 1885.

"SCRYMSER.

"President Diaz charges me to inform you of his satisfaction for the exact and remarkably opportune service of the telegraph lines under your skillful direction, and to give you his cordial thanks for the rapidity with which he has from day to day received the very important news from Central America which he deems of such great political interest. CAMACHO, VICE PRESIDENT."

"PUBLIC NOTICE:

"The Consul General of the United States having informed me that an armed force was erecting barricades which would interrupt communication with the offices of the American Cable Company (Central & South American Telegraph Company). I have entered peacefully into the city, and have taken the necessary measures to protect American interests.

"Good citizens have no occasion for alarm.

"All cafes and bars must be closed.

"The forces under my orders will undertake the police, and the entry into the town by the land side will not be permitted to any armed force, nor to vagabonds.

"B. H. MCCALLA,

"Commanding in Chief of the Marine Forces of the United States on the Isthmus of Panama.

"April 25th, 1885."

From the above orders it is clear the United States Government would not allow any interference with through international telegraph messages or diplomatic dispatches as the statement in your journal would lead one to believe is the case.

Respectfully,

J. R. FRANCE, Gen. Man.

.... The Mutual District Messenger Company of Boston has changed the time of its quarterly dividend payment from June to July 1.

.... Mrs. Prudence Cumback, of Daddsville, O., has patented a muzzle which can be put on the old man, effectually preventing him from kissing the hired girl. If he does, an electric current is produced which rings a bell, strikes a gong and blows a whistle in the kitchen. The factory is running night and day, and is away behind the orders.

.... The House of Lords has decided a great case, involving about $100,000—the Direct Cable Company against Messrs. Muirhead, patentees of the duplex system. The decision of the Lord Chancellor was adverse to the cable company. The question was whether the company should pay the duplex a royalty of £2,000 per annum under agreement, they having ceased to use the duplex, owing to the fact that the cable got in such a state that the duplex system could not be applied. It was contended for the Direct Company that, though the duplex system operated satisfactorily for five years, they were, when the lines got into such a state that it could not be applied, entitled to cease payment of royalty for it. The patentees argued that the whole scope of the argument showed that as soon as the duplex system proved successful then the company was bound to use it and to pay royalty.

.... The lines of the Southern Telegraph Company have been transferred to the Western Union offices and the Southern company has become a portion of the Western Union system. The Southern Telegraph Company has about four thousand miles of wire extending south from Washington to Macon, Savannah, Montgomery and intermediate points. Some time ago an extension to New Orleans and other extreme Southern cities was started, but was not finished. The Southern Telegraph Company was incorporated about two years ago under favorable auspices, and began at Washington to build wires through the South. The lines were extended as far South as Charlotte, N. C., when some of the bondholders became dissatisfied, as up to this time there had been no returns from the investment. A. W. Imock then leased in the name of the Bankers and Merchants' Company, of which he was president, the entire plant of the Southern company for the term of twenty-one years, agreeing to pay therefor six per cent. on its capital stock per year, and also to extend its lines Before the first year's interest became due a Wall street cyclone, which uprooted the mathematical calculations of Ferdinand Ward and other embryo millionaires, also agitated Mr. Dimock to the extent of driving him into retirement, and the Bankers and Merchants defaulted on their obligation to the Southern.

TELEGRAPHIC

.... Indianapolis contemplates putting in the police telegraph and telephone system in use in Chicago.

.... The submarine telegraph cable between Falmouth and Cottage City is now in good working order.

... The Leclanche battery has been substituted for the Marie-Davy battery used until now in the French colonial telegraph service.

... Reichemberg's system of telegraphing and telephoning on the same wire simultaneously has, it is said, been tried with success between Madrid and Toledo.

.... Edward Harland, of Norwich, Conn., has been appointed receiver for the property of the American Rapid Telegraph Company, doing business in Pennsylvania.

.... "Oh, dear!" exclaimed Clara, who was engaged in preparing a telegraphic despatch, "I have got only nine words; how am I going to make it ten?" "Let's see," said Henry; "oh, yes; there is a chance to put in an 'and.'" "So I can; but can't you think of a longer word, Henry? It won't cost any more, you know."

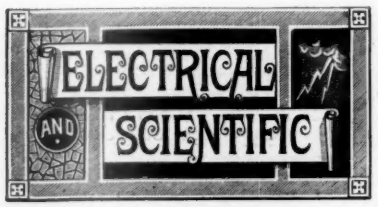
.... At the annual meeting of the Franklin Telegraph Company, held at the Western Union Building, the following directors were elected for the ensuing year: Charles A. Tinker, A. R. Brewer, Norvin Green, Thos. T. Eckert, Frederick L. Ames, John Van Horne, Jay Gould, Thos. Roche and Joseph F. Greenough; treasurer, R. F. Rochester; clerk, Thomas Roche.

.... The three telegraph operators who left New York for Siam, last week, for the purpose of instructing the foreigners in the Morse art, are Martin J. Dixon, Eugene Perkins, and A. Field, each gentleman being accompanied by his wife. They each get $120 per month, first-class passage to Siam, three years' contract, $50 spending money on the trip over, house found, and return passage at end of three years, if alive.

.... It is stated in a letter of one of the officials of the Southern Telegraph Company that they have not sold out to the Western Union, but have made a commercial alliance with the Mutual Union Telegraph Company. It is explained that the change from the Bankers and Merchants' was made by the Southern Company for the purpose of securing a more efficient and cheaper service for their Northern business and at the same time a wider field of operations.

.... The Postal Company is in the hands of a receiver, and the final outcome will be like unto the Bankers and Merchants'. As we have repeatedly said in these columns during the past three years, no opposition can stand against Western Union. They may cut down the latter's net profits—even force it to a temporary reduction of dividends—but eventually all will be ruined, and then Western Union will be stronger than ever.—*Gould Organ.* This is probably not as true as the *Gould Organ* might wish. There is an "opposition" known as the B. & O. that stands pretty well for its age.

.... The main points of the Bankers and Merchants' Telegraph reorganization scheme are officially stated as follows: There will be an issue of 6 per cent. first mortgage bonds, limited to $1,200,000, to take up the receiver's certificates and exchange for the divisional bonds. A second mortgage bond, bearing no interest for the first two years and 3 per cent. after that, will be exchanged for the present bonds at the rate of one new bond for two old ones. The present stockholders are to get 25 per cent. in new stock. A majority of the bondholders have signed this reorganization plan, and the committee will keep the agreement open for signatures for twenty days. The property of the company will be advertised for sale under the foreclosure decree in a few days.



* * A correspondent wants to know why it is that the Mississippi is four hundred feet higher at its mouth than at its source. The question, like that famous hydrostatic problem which the Royal Academy discussed until Charles I. asked the question that upset all the debates, may be answered by asking, "Is it ?"

* * A great railroad bridge, 3,000 feet long, is to be built over the Hawkesbury river, in New South Wales, Australia. The soundings appear to show that the foundations for piers must be sent down to a greater depth than any ever sunk by man in the whole history of engineering, the water in some places being seventy-seven feet deep, and in others, where the water is forty-five feet deep, the mud and sand is 125 feet, making 170 feet in all to sink the piers below tide. This bridge is to be for double tracks, and will cost over $2,000,000.

* * In reporting to the Empress of China the occurrence of a violent earthquake at the town of Pu-erh, on November 14, last year, the Viceroy of Yunnan observes with humility that this awful visitation is to be regarded as a penalty of Heaven for his own inefficiency and incompteency and that of his staff. They will, the memorialist promises, endeavor to take the lesson to heart and earnestly amend their ways. Pu-erh is an important town on the borders of the Shan States, with a large trade in tea. The earthquake here referred to is worth notice as showing that seismic activity during the past winter was manifested over a vast area.

* * Colonel Prejwalski, the well-known Russian explorer of Central Asia, writes to the Geographical Society at home that he has discovered gold mines, worked by the natives of Thibet, so extensive that he ventures the opinion that this country will prove the equal of California in this precious mineral. Near the head of the Hoang-ho, on the southern slope of one of its tributaries, he came across some thirty Tawgots engaged in a rough sort of placer-mining, taking the gravel from a depth of only one or two feet, and yet, as a result of this ancient methed of obtaining the gold, the natives had great quantities of the mineral in large pieces, none of them being smaller than a pea. Of course, civilized handling of the deposits would make such gravel pay enormously at small outlay, and the deposits are of the most extensive character, the whole northern part of Thibet being rich in such areas.

* * Dr. S. D. Bowker, of Kansas City, in writing of electricity as a medical agent, says: "I am glad to state that there are a goodly number of physicians in this and other lands who are finding in this most wonderful agent the means of cure for many diseases over which ordinary medication has no influence. Everything depends on a knowledge of the construction of the battery, and the nature of the power generated by the union of the various elements of the battery, and in a special sense on the knowledge of the effects of the various kinds of electricity over diseased conditions. I am sure it is not too strong to assert that not five out of an hundred of all the physicians in the land have the faintest knowledge of the difference between the Galvanic and Faradic currents, or the difference in their effect over disease. It is no lack of ability on their part, but simply because it does not form a part of their medical study. They call us 'quacks' when we affirm that a good Galvano-Faradic battery possesses the most perfect chemical and mechanical power over every tissue of the human body. In despair of cure from medicine, if you consult the physician who has not studied electricity he will surely discourage its use, or point you to some one who hawks it about as the *sure cure* for all human ailments."

* * L. G. Doane says, in *The Microscope:* Upon a slip of glass put a drop of liquid auric chloride or argentic nitrate, with half a grain of metallic zinc in the auric chloride, and copper in the silver. A growth of exquisite gold and silver ferns will grow beneath the eye.

* * Experiments have recently been conducted in the Lake of Geneva and elsewhere by MM. Fol and Sarasin, to determine the depth to which light penetrates in its waters. The method of experimenting was to submerge photographic plates of gelatine bromide of silver at various depths and develop the luminous images produced on them by rays penetrating from the surface. A coating of bituminous varnish easily removable by alcohol, or spirits of turpentine, served to guard the sensitive layer from the chemical action of the sea-water. The rays affected the sensitive surface through a layer or back-plate of glass. Oxalate of iron was employed as the developer, and allowed to act for ten minutes. In clear sunlight during March, and near Villefranche-sur-Mer they obtained images to depths of about 400 meters. The images increased in strength as the depth diminished. In the Lake of Geneva, they, however, only obtain images to a depth of about 200 meters, or half as far; and the authors conclude that in the winter months sunlight does not penetrate further than 200 meters, while in the Mediterranean it stops at about 400 meters deep.

Telegraphic.

The following table, an extract from the statistics for 1883 of the International Bureau of Telegraphs, at Berne, Switzerland, and recently published by its official organ, the *Journal Telegraphique*, will be found of interest:

STATES.	LENGTH OF LINES IN KILOMETERS.*			TOTAL.	KILOMETERS OF WIRE CONDUCTORS.		TOTAL.	PNEUMATIC TUBES.
	Aerial.	Underground.	Submarine.		Aerial.	Underground.	Submarine.	
Germany	70,505	5,644	69	76,218	235,307	38,076	153	273,534
Austria	23,811	46	179	24,036	64,237	642	193	65,062
Belgium	5,931	11	.....	5,942	26,694	235	.....	26,929
Brazil	7,821	.....	24	7,845	13,652	.....	34	13,686
Denmark	3,612	... .	161	3,777	9,469	.....	861	10,451
Spain	17,173	4	236	17,524	41,851	121	236	42,424
France	71,893	115	4,413	77,410	223,548	337	4,543	241,138
Gt. Britain & Ireland	41,230	1,104	2,075	44,168	194,683	13,048	6,784	234,798
Greece	4,862	863	1,090	5,952	6,223	23,331	* 1,090	7,313
Italy	26,763	.....	178	26,941	74,922	.....	178	75,100
Japan	8,038	.....	83	8,121	22,375	.....	178	22,553
Portugal	4,871	.....	.....	4,871	11,611	.....	.....	11,611
Russia	100,504	.....	501	101,256	187,219	387	618	188,274
Sweden	8,450	251	101	8,551	20,574	.....	138	20,712
Switzerland	6,753	.....	18	6,838	16,150	385	18	16,553
		67						

*Kilometer = 0.62 mile.

Preventing Collisions With Icebergs in a Fog.

By Alexander Graham Bell.

The recent accident to the steamer City of Berlin emphasizes the importance of devising practical methods of ascertaining the proximity of icebergs in a fog. The precautions adopted by Capt. Laud, though they saved the lives of more than fourteen hundred passengers, and prevented serious damage to the vessel, did not prevent contact with the berg. Even the "lookouts" were unaware of the proximity of the iceberg until it was actually upon them.

Under these circumstances, the method proposed by Mr. Frank Della Torre, of Baltimore, deserves consideration. His experiments indicate the possibility of obtaining an echo from an iceberg when in dangerous proximity to a ship. Mr. Della Torre believes that even an object offering so small a surface as a floating wreck may in this way be detected during a fog in time to prevent collision. However this may be, it is certain that his method is worthy of a careful trial at sea, and that preliminary experiments, recently made in the presence of Professor Rowland, of Johns Hopkins University, and the present writer, have demonstrated the feasibility of producing well-marked echoes from sailing vessels and steamboats at considerable distances away.

These experiments were made on the River Patapsco, near the head of Chesapeake Bay, at a point about seven miles from the city of Baltimore. The party proceeded down the river in a steam launch to the selected place, where the distance from shore to shore appeared to be about three miles.

The launch was kept so far from land as to prevent the possibility of mistaking an echo from the shore for one produced by a passing vessel.

The apparatus employed consisted of a musket, to the muzzle of which a speaking trumpet had been attached. This gun was aimed at passing vessels, while blank cartridges were fired. After a longer or shorter time, according to the distance of the vessel, an echo was returned.

The ordinary river steamboats, and schooners with large sails, returned perfectly distinct echoes, even when apparently about a mile distant. At shorter distances the effects were, of course, still more striking.

In order to test the effects under the most disadvantageous circumstances, blank cartridges were fired in the direction of an approaching tugboat. The surface presented was, of course, much smaller than if the boat had presented its broadside to the launch. As the boat approached bow on, it corresponded to a target somewhere about six feet square, presenting a convex surface to the impinging sound wave. Even in this case a feeble echo was perceived when the boat was at a considerable distance (estimated to be nearly one-quarter of a mile). That any echo should have been perceived at all under such circumstances, was a surprise. The sound was heard only by the closest attention, but in the case of larger vessels the effects were very distinct and striking.

Experiments were made which demonstrated the fact that the speaking trumpet attached to the gun was of material assistance in giving direction to the sound impulse, and in intensifying the audible effect.

Mr. Della Torre claims that a steam whistle or siren, combined with a projecting apparatus like a speaking trumpet, will prove as efficient as the gun.

During the experiments on the Patapsco River, a curious rumbling effect, like the rolling of thunder, was often observed, which continued for some seconds. A similar sound was also noticed, as an echo from a well-wooded shore; but the effect alluded to above could not have been due in any way to the land, as the sound commenced immediately upon the firing of the gun, whereas the shore was distant at least a mile or a mile and a half.

The sound was probably due to the presence of ripples on the surface of the water, as the effect was much less marked when the surface was smooth. Such a sound might prove a disturbing element of importance in a rough sea, but would hardly be sufficient to prevent the detection of an echo from a large iceberg. Had shots been fired periodically from the bow of the City of Berlin, it can hardly be doubted that the presence of an obstacle ahead would have been discovered in time to prevent the collision that actually occurred.

Some Points in the Source of Volta-Electricity.

The points to which the author draws attention are such as may perhaps lead to a quicker realization of a cheap and efficient form of primary battery, no great progress having been made in this direction for the last fifty years. The working of every form of battery depends, on the one hand, on the electrical difference between a difficultly oxidizable metal (in which class carbon must be included) and an easily oxidizable one (practically zinc)) on the other hand, on the simultaneously developed electrical difference between these metals and the gaseous components of watery fluids. The atoms of hydrogen which tend towards the negative pole are the carriers of the undefined *something* which appears in the external circuit as an electric current. Two plates of one and the same metal (platinum) produce, however, a powerful current, after they have been used for a few moments for the electrolysis of water. The plates themselves remain chemically unaltered. Also a cell composed of two platinum plates and two antagonistic liquids will produce electricity. Two lead plates in dilute sulphuric acid will also give a powerful polarization current under similar circumstances. The cause of the current must be the difference of potential between lead and lead peroxide. Grove has constructed a gas battery from two plates of platinum dipping into diluted sulphuric acid, and two gases, hydrogen and oxygen. Collecting together the above points, we have—

1. Two different metals, two liquids, of which one can be decomposed by a solid body. Tue electrode which becomes positively polarized is dissolved (oxidized), and sends out negative electricity into the circuit.

2. Two platinum plates, one liquid. The previously negatively-polarized plate, charged with hydrogen, sends out negative electricity. Neither electrode is oxidized.

3. Two platinum plates, one acid, one alka line liquid. Neither electrode is oxidized The one charged with oxygen produces negative electricity.

4. Two lead plates, one liquid. The previously negatively-polarized plate sends out negative electricity. An amorphous metallic oxide plays the part of the electro-negative metal of the second plate, not of the electrode covered with it.

5. Two platinum plates, partly immersed in liquid, two gases, which surround the unimmersed portions of the plates. Neither electrode is polarized, neither is oxidized. The one surrounded with hydrogen sends out negative electricity.

If now we consider electricity, like magnetism, as a special state of matter, then this state can be brought about by five different causes. If we call in the aid of the æther, we are not much advanced, for we must admit that a certain manifestation of force, which we call electricity, has no fixed material cause.

Since the electricity furnished by the five typical cells given above does not differ in kind, but only in degree, if on comparison we can find some property which is common to all without any exception whatsoever, we may conclude, with a high degree of probability, that the existence of this property must be the cause of the production of the electric current. In fact, if we confine ourselves to the case of cells on closed circuit, we find that such a common property of all the five types is the existence of oxygen and hydrogen. With the exception, therefore, of the fifth type, we may say that the existence of free or nascent hydrogen and oxygen on the electrodes is common to all voltaic cells. The oxygen and hydrogen, being nascent, have a greater chemical affinity than the same gases in their ordinary condition,

and they will therefore not remain for an instant free, if any elements with which they can combine are in their neighborhood. In all voltaic cells, therefore, new molecules of water will be formed, and their formation is the ultimate result of a movement in a fixed direction, which probably in the form of undulations, can take place, either from one electrode to the opposite, or from the center towards both, or from both towards the center. It is probable that this movement always takes the shortest path. Since this movement always occurs in voltaic cells, we must conclude that the production of the electric current is dependent upon it, *i. e.*, on the motion itself, and not on the formation of water, which is only a means to the end. The nature of the electrodes is indifferent so long as they are in a condition to conduct the electricity produced, and are not destroyed by the active gases. The so called electro-positive metals owe their denomination exclusively to their capability of being oxidized, the electro-negative to their not being attacked by acids. Since the development of hydrogen and oxygen in the five typical cells arises in five different ways, it follows that the nature of this development of gas cannot be essential. The elementary conditions for the existence of an electric current are, therefore—

1. The production of nascent oxygen and hydrogen at such points of an acidified liquid that a continuous movement is set up, which probably arises from the decomposition and recombination of the molecules of water, and proceeds either in one direction or in two opposite directions, and which results finally in newly formed water.

2. Two plates of metal (or carbon) which are in a condition to take up and propagate this movement.

The whole of our galvanic batteries, with the exception of the first type, are in reality gas batteries. From the elementary conditions enumerated above, it would appear that the conditions for the rational construction of an economic battery are—

1. The production of hydrogen and oxygen (perhaps also chlorine) outside the battery.

2. The introduction of these gases in the active (nascent) condition.

3. An acid liquid of the highest possible conductivity.

4. Electrodes of some material with very fine pores and least liable to be acted upon (probably only carbon would do), in the form of closed vessels with large surface, which should permit of the passage through the sides of the gases brought into them under pressure in the ratio of 1 : 2.

It is not possible to consider so uncertain an experiment as Volta's fundamental one as the explanation of a new theory—an experiment which can give no minute results; for how can it be possible to bring two metal plates into contact with each other without friction, without pressure, without chemical action due to the surface layers of gas, without traces of moisture, and without differences of temperature? any one of which circumstances would suffice to explain the phenomena observed. To attribute to the various elements an individual and innate electrical polarity, in order to explain thereby the secret of chemical attraction, seems a mere play upon words; it is as much as to say, for instance, that hydrogen and oxygen attract each other because they possess attractive properties.

* * A Missouri lady, it is said, has taken out letters patent for an electric indicator which, when attached to the bed-post, will show, by glancing at the dial, whether there is a horrid man under the bed. The saving of time in a year will more than pay the cost of an instrument.

—— W. J. Jenks, for a long time with the Edison Company as manager of the Brockton (Mass.) plant, and in other capacities, has resigned his position with that company to become manager of the incandescent department of American-Edison combination. The Edison management say he is one of the best men they have ever had in their service, and is fully competent for the position.

The Telephone Business in Mexico.

The report of the treasurer of the Mexican Central Telegraph and Telephone Company, presented to the stockholders' meeting held in New York recently, is given in full. The New York office of this company is at 38 Pine Street. Principal Mexican office, Guanajuato; Senor Comercial Jones, general manager.

March 1, 1884, to March 1, 1885:

	Mex. Money.	Am. Money.
Total receipts in Mexico for year	$14,544.37	$11,635.50
Total expenses in Mexico for year	10,754.90	8,603.92
Balance	$3,789.47	$3,031.58
	Am. Money.	**Am. Money.**
By cash from Mexico July 1, 1884. to May 1, 1885	$3,257.79	
By loan from J. W. Weed and Geo. Wm. Ballou	1,700.00	
To paid Mexican Telephone Co, royalty, one year, 400 telephones		$2,000.00
To paid Mexican Telephone Co., old indebtedness acct.		1,365.93
To paid Delano, old bills in full		171.72
To unusual Miekle, salary as secretary in full		440.00
To paid office rent to May 1, 1885		241.66
To paid H. Hunter, special services (resolution of March 7, 1885)		300.00
To supplies sent to Mexico		49.50
To traveling expenses		209.00
To stationary, printing and office expenses		111.52
Balance		68.46
	$4,957.79	$4,957.79
Remittance in transit	$240.00	
Due from Mexican Telephone Co. on acct. of borrowed goods	1,300.00	
Indebtedness:		
Note to Mexican Telephone Co., due August 5, 1885		$1,568.82
Notes to Messrs. Weed and Ballou, due April 5, 1886		1,700.00
	$1,540.00	$3,268.82

By contribution, agreement of March 11, 1885, the stockholders contributed to the company 7,346 shares of stock to cancel $20,000 notes and interest. To the treasury added 1,785 shares, making a total of 9,131 shares, which was accepted by the holders of the $20,000 notes and $1,000 accrued interest in full satisfaction of same, being equivalent to $2.30 per share, par being $10 per share.

The company had of its own stock in treasury 2,350 shares. There now remains in treasury 592 shares, and there is still due to the treasury for contribution 72 shares.

During the early months of 1884 the expenses in Mexico exceeded $1,000 per month. (They had before that time been $1,200 per month.) By economical management they have been reduced to $693.88 per month, a saving of over $300 per month, equal to $3,600 per year Mexican, or American money $2,880. Of the $1,533.40 expended in New York, over $1,200 for rent, salary, and expense of re-organizing can be saved this year, rent being $100 per year and no salaries to be paid, an annual saving of, say, $1,200. Under new contract we may stop paying royalty of $2,000 per year, after December 31 next, by purchasing telephones in use (400 telephones at $10 = $4,000) by issue of $4,000 bonds at 8 per cent., making annual interest $320, and saving $1,680. Estimated saving in yearly expenses, $5,760.

Under new contract with parent company (the Mexican Telephone Company) we may purchase telephones for private lines at $10 per set. This private line business should yield a profit equal to all the exchange business.

With the incubus of $20,000 debt removed, an improved contract, the progressive influence of the Diaz government, the richest territory in Mexico on the only railroad connecting with the United States, and with careful and economical management, the company seems at length to be on the high road to dividends, and a consequent fair market value for its stock.

Respectfully submitted,
HAMMOND HUNTER, Treasurer.

An Operator's Presence of Mind.

Two telegraph operators of Philadelphia took an airing in the park. They strolled as far as Lemon Hill, where they threw themselves on the grass in delicious abandon. Unknown to one of them, his money, consisting of silver change, slid from the capacious pocket in which it had been placed and nestled in the grass. Shortly after the gentlemen espied two of their lady friends sauntering in their direction. The couples met, a few nothings were exchanged, and they adjourned to partake of cream.

As the bottoms of the ice cream plates slowly crept to view under the vigorous attacks of the spoon manipulators, and the gentleman who was unfortunate in the first instance thrust his hand into his pocket to draw forth his wealth and settle for the four plates of cream and two of cake, a look of consternation crept into his open countenance.

In reply to a query, he remarked he was feeling well enough physically, but that he was mentally affected at the remembrance of the pilfering of an apple from a blind lady in his younger days. He then gazed abstractedly into space, and drummed without thought, apparently, upon the table with his fingers.

Unknown to the ladies, he was using the Morse system to apprise his companion of his loss. The one addressed heard and understood his friend's mute appeal, and replied in like manner: "O. K., have enough for present necessary expenses and to purchase that two-cent stamp I spoke of."

His friend was recalled from his youthful remembrance, and surprised the ladies during the balance of the day with his cheerfulness and good humor. He now says boys should acquire an occupation in their youth that they can rely upon in the days of adversity and trouble.

The Latest Electricity Story.

An unusual phenomenon occurred in the vicinity of Philadelphia last week in the form of an atmospheric electric current of considerable power. As observed, the current did not reach the ground, but varied in distance from four to six feet from it. It was first noticed by the peculiar effect it had on horses and cattle. A buzzing sound was heard from around the ears of the animals—similar to that made by the swarming of bees—distinctly audible at a distance of several feet. Horses and mules threw their heads around in a very excited manner, acting as though their ears were full of flies. The snapping of electric sparks was also heard. Horses which kept their heads close to the ground were not troubled, as the current did not seem to reach down to them. Many teams became frantic and uncontrollable. One horse was so frightened that it fell and tried to creep under its mate for protection. Oxen also behaved in a very unreasonable and sprightly manner. Farmers were frightened and hurried to the barn with all possible speed. One man thought his horse had the blind staggers. He accordingly bled the animal, and resolved "to keep dark about it" until he could make a trade. The amount of tricky stock in the market about that time was alarming, but there never was so much innocence among Spink county farmers before. Finally, a brief thunder shower came up, and the first flash of lightning afforded immediate relief. The current flowed from west to east, and was six or seven miles in width.

Atmospheric Electricity.

Professor Palmieri, of the Vesuvian Observatory, has recently published some observations of interest on atmospheric electricity. In clear weather the atmospheric electricity is usually positive, if negative, a downfall of rain, etc., may be inferred to be going on at some little distance. There is a maximum of atmospheric electricity at 9 A.M., another soon after sunset, which often continues during a great part of the night. A minimum takes place before daybreak, and another in the afternoon. This periodicity is, however, disturbed by atmospheric movement. When the maxima are very pronounced, cloudy weather often follows. If the sky becomes overcast the electric indications grow stronger, and if at the time of the evening maximum the relative moisture increases with a heavy dew, maxima of special duration and intensity may be expected. The assumption that atmospheric electricity becomes stronger with altitude is not borne out by the Vesuvian observations. Lower potentials are generally observed on hot summer days; in spring and autumn the indications are stronger; in winter they are uncertain. On cloudy days the potential is less intense, but positive; during rain the potential increases. A rain zone is positive but surrounded by a negative zone, which again is surrounded by a zone of positive electricity. According to Palmieri, there is no thunder and lightning without rain.—*Engineering.*

—— The city Council of Detroit decline to advertise for proposals to light the city with gas.

ELECTRIC LIGHT NEWS

—— The Boston Bijou Theater audience was photographed last week by electricity with very satisfactory results.

—— In Springfield, Mass., the council has voted to extend the present system of electric lighting. The more light they have the more they want.

—— The Council of Portland, Me., have ordered an increase of the electric lights to 100. The more light, the better pleased are the citizens everywhere.

—— The Executive Committee of the National Electric Association located the next meeting of the Association, August 18th, at the Union Square Hotel, New York.

—— Mr. C. H. Cone accepts the position of general agent for the Electrical Supply Company, Chicago, and will proceed at once to make happy all those who are in need of electrical supplies. He is a good man for the position, and will be a strong factor in the electrical field in the West.

—— The report of William Henry Rawle, Esq., as Master in the equity suit brought by the Board of Trade in the name of the Commonwealth against the Brush Electric Light Company of Philadelphia, to compel that corporation to put its wires underground, was sustained by the Court of Common Pleas No. 2 in a decision dismissing the exceptions thereto. Mr. Rawle decided as a scientific fact that no practicable underground system had yet been devised, and that a decision in favor of the complainants would embarrass the operations of the company.

—— For some time John R. Markle, representing the Edison Electric Light Company of New York city, has been organizing a company of Michigan capitalists for the purpose of introducing the Edison light for general household use through the State. A meeting of the projectors was held at the Michigan Exchange last week, when the merits of the system were fully explained. A committee consisting of David H. Jerome, of East Saginaw; John E. King, Gordon W. Lloyd, Theo. H. Buhl and Frank H. Walker, of Detroit; Wm. Westover, of Bay City, and Wm. L. Smith, of Flint, were appointed to complete a permanent organization. Many of the wealthiest men in the State are interested in the project. It is proposed to supply each house with incandescent lights, which can be used the same as gas, the consumption being registered by an electric meter. In New York city 20 miles of this service have been introduced with satisfactory results. The committee will report the details of organization at an early day.

—— The details given of the lighting by electricity of the steamship Olympo present a novel and interesting feature, namely, the introduction of lighting by storage batteries. There are forty-five cells which can be charged while the dynamo is running and lighting lamps, and this accumulated energy may be used for illuminating any portion of the vessel when she is in port and steam cannot be obtained. The steamer's installation consists of 320 incandescent lamps of twenty-candle power, divided into six circuits, each of which is controlled by a switch in the engine-room, and every stateroom is provided with a lamp having a separate switch under control of the occupant. Over each gangway, suspended by strong swinging brackets, is a lantern containing a group of six incandescent lamps of twenty-candle power, and these lanterns can be shipped or unshipped at pleasure. The engine for driving the dynamo is of improved construction, and its speed is controlled by an Auldo reducing valve placed close to the switchboard. The dynamo is capable of lighting 400 lamps, running at 900 revolutions per minute.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 2, 1885.

319,001 Unison device for printing telegraphs; Lawrence A. McCarthy, Brooklyn, N. Y.

319,042 Electric telephone; Henry E. Waite, New York, N. Y.

319,043 Telephone apparatus; Henry E. Waite, New York, N. Y.

319,048 Electric telephone; Charles E. Allen, Adams, Mass.

319,053 Electric burglar alarm; Joseph Barkheimer, Des Moines, Iowa.

319,079 Composition of matter for the preservation of paper or vegetable tubing used for the insulation of telegraph wires; James W. Ellis, Brooklyn, N. Y., assignor of two-thirds to Josiah W Parker, same place, and Henry D. Harris, New York, N. Y.

319,084 Preparation and production of insulating materials; John A. Fleming, Pimlico, London County of Middlesex, England.

319,112 Underground conductor for wires; Burnet L. Nevius, Washington, D. C.

319,129 Incandescent electric lamp; Emile I. Roussy, Vevay, Switzerland.

319,177 Holder for incandescent electric lamps; Alexander Bernstein, Boston, Mass., assignor to the Bernstein Electric Light Manufacturing Company, Portland, Me.

319,197 Conduit for electrical conductors; William Cohlman, Philadelphia, Pa.

319,201 Telegraph sounder; John W. Delmege, North Billerica, Mass.

319,217 Friction roller for wire cables: Thomas W. Flynn, Pottsville, Pa.

319,234 Automatic instructor; Waldo L. Gates, Bayonne, N. J., assignor by mesne assignments to the Electric Automatic Instructor Company, Portland, Me.

319,259 Secondary electric clock; Charles A. Hussey, New York.

319,318 Electric bell; Ernest F. Recorden, Geneva, Switzerland.

319,326 Electrical conductor; W. H. Sawyer, Providence, R. I.

318,347 System of electric lighting; William M. Thomas, Grand Rapids, Mich., assignor of one half to the Grand Rapids Electric Light and Power Company, same place.

319,380 Electrical lighting apparatus: Ernest Arnould, Paris, France.

319,384 Safety catch plug for electric circuits; Sigmund Bergmann, New York, N. Y.

319,415 Electric telephone transmitter; Edward H. Johnson, New York, N. Y.

319,420 Conduit for underground wires and cables; Burnet L. Nevius, Washington, D. C.

319,428 Quadruplex telegraph; Gerritt Smith, Astoria, N. Y.

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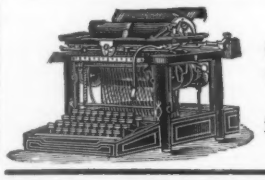

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